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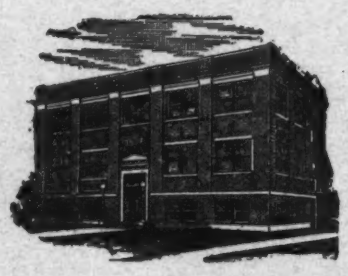

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LOCALIZATION OR ELIMINATION OF CEREBRAL TUMORS BY VENTRICULOGRAPHY

BY WALTER E. DANDY, M.D., BALTIMORE
From the Johns Hopkins Hospital and University

IT seems incredible that a brain tumor as large as one's fist can exist in either cerebral hemisphere and still escape localization by expert neurologists and neurologic surgeons. Yet nearly all cerebral tumors eventually attain this size, and a very high percentage of them can neither be accurately localized before operation nor be found by an exploration of the brain.

In a recent analysis of a series of 70 cases with neoplasms of the brain, Dr. Heuer and I[1] have shown that of 45 cases which were presumably located in the cerebral hemispheres, 20, or 44.4 per cent, escaped detection at operation; and at the time of that publication we considered this a high record in verifying the location of cerebral tumors. This percentage is not strictly correct, for several of the cases were submitted to more than one operation before the tumor was disclosed. On the other hand, in many cases which seemed to present definite signs of localization, the tumor could not be found because it was situated too deeply in the brain.

A more careful analysis of these figures disclosed to an even greater extent the limitations of the neurological signs which are helpful in localizing brain tumors. Nearly all of the tumors which could be localized with certainty were in one of three locations,[2] in each of which the signs are pathognomonic: (1) hypophyseal or third-ventricle tumors gave the characteristic disturbances of the optic tracts and destruction of the sella turcica; (2) precentral or postcentral lesions were evident by the contralateral motor or sensory disturbances; and (3) neoplasms affecting the motor or sensory speech centers produced the typical deficiencies of speech. The remaining cases which were localized exclusively by other methods, such as changes in the eye-grounds, disturbances of the other cranial nerves, etc., really comprised a very small group.

There is only one satisfactory form of treatment for brain tumors, i.e., complete operative extirpation of the tumor. It is not conceivable that neoplasms of the brain ever disappear spontaneously or are cured or even benefited by any form of medical therapy. Nor, in our experience, has radium or the X-ray produced even temporary beneficial results. All attempts at medical treatment only cause delay which is disastrous to the individual; just as in the growth of malignant neoplasms of the breast, there is a time in the development of the tumor when its removal is possible and relatively easy and a complete cure will result. This opportunity

[1] HEUER, G. J., and DANDY, W. E. A report of seventy cases of brain tumor. Johns Hopkins Hosp. Bull., 1916, xxvi, 224.

[2] These statements, of course, have reference only to lesions of the cerebral hemisphere and do not include tumors of the brain stem or the cerebellum. This paper is intended to consider only the localization of tumors which are supposed to be situated in the cerebral hemispheres.

is now too frequently lost in tumors of the brain because the diagnosis is made too late and because time is lost in misdirected and useless therapy. The treatment of intracranial tumors is now passing through the incipient and least fruitful stages, and is roughly where the treatment of breast tumors was 25 years ago, or where the treatment of appendicitis was 30 years ago. In both of these conditions the treatment has gradually become exclusively surgical and every effort has been directed toward an early diagnosis. The results of these efforts are now so thoroughly recognized that for all delay in treatment the physician in charge is held responsible.

When intracranial tumors are recognized and localized early, extirpation will be relatively simple and the permanent results will be vastly greater than those of today. The character and position of many tumors will, of course, preclude the perfect results which obtain in the operative treatment of appendicitis today, but they will undoubtedly surpass the operative results in early malignant lesions of the breast. Gliomata arising very deeply in the brain or in vital parts of the brain must still be looked upon as hopeless, but the vast silent areas harbor most of the incipient brain tumors, and from these regions tumors can be removed with impunity. There are even important areas which, with proper caution and due respect, are no longer considered *noli me tangere*, and from which tumors can be extirpated without permanent disability. At the present time, the operative procedures are greatly in advance of the methods of diagnosis, and in competent hands are fairly adequate. Small *enucleable* brain tumors can be removed with very little danger, and even large enucleable tumors can be removed with but a slight mortality, though the hæmorrhages in these cases require an operator of large experience. Small *infiltrating* tumors can be removed with the contiguous brain tissues with but little danger, but there is little chance of removing a large infiltrating tumor without a recurrence. Other things being equal the results, immediate and remote, are directly proportional to the stage of growth of the tumor.

Only as a last resort should an exploratory craniotomy or a decompression be done. A subtemporal decompression, though the simplest major cranial operative procedure, is often not only a useless operation to the patient but is frequently accompanied by a pronounced injurious effect. As a routine procedure it is questionable whether it does more good than harm. In all cases of hydrocephalus no relief can possibly result, for the cause of the hydrocephalus nearly always being in the brain stem, is unaffected and the ventricular dilatation continues to increase as rapidly as the extra space afforded by the bony defect will permit. This of course causes greater brain destruction. In advanced cases the result is not infrequently fatal, particularly so when the larger procedure of a combined exploration and decompression is performed. To perform a decompression or an exploration, an internal hydrocephalus should always be excluded. If a hydrocephalus is present a cerebellar exploration is usually, though not invariably, indicated. But here again the question of diagnosis is all important. It is frequently just as difficult to tell whether a lesion is in the cerebral or cerebellar hemispheres as it is to define its exact location.

At best a decompression is only palliative treatment and by the delay between the time at which a decompression is made for a so-called unlocalizable tumor and the later operation for its removal, after self-localization, the patient's chances of a complete cure have dwindled tremendously. The crux of the whole matter is that no brain tumor can be cured without operative removal; and that the earlier the diagnosis and localization is made the better the chances of a cure. The future outlook in the treatment of brain tumors is dependent almost entirely upon early recognition and localization of the tumor.

In a recent publication by the author, a new method—ventriculography or pneumoventriculography—was introduced, by which it was hoped that intracranial localization would be greatly assisted. At that time the procedure had been tried in only a few cases, but the results were such as to indicate

alluring probabilities. I now hope to show the efficiency of this method in *cerebral* lesions and where all other means at our command have failed to localize the growth. I venture the prediction that by an intelligent use of this method[1] in the hands of competent neurological surgeons but few cerebral tumors will escape localization. During the past two years I have completely removed over twenty brain tumors in Professor Halsted's service. Many more have been partially removed or treated by palliative procedures. Many of the tumors treated partially, and therefore unsatisfactorily, could have been completely removed had they been received earlier. The time will come when it will be just as reprehensible for a physician to delay the proper treatment in a case of brain tumor as it is now to await developments in a case of acute appendicitis. When one considers the terrible train of events which must inevitably follow the development of a brain tumor—blindness, headache, paralysis, aphasia, etc.—the burden of the delay must fall heavily upon those who are responsible for the failure correctly to diagnose the lesion or at least for the neglect in sending the patient to a competent neurologist or neurological surgeon.

PROCEDURE FOR LOCALIZATION OF THE TUMOR BY VENTRICULOGRAPHY

Each lateral ventricle occupies a large area in the interior of either cerebral hemisphere. It is evident that a tumor of any size situated in either cerebral hemisphere will modify the shape, size, and position of the corresponding lateral ventricle. Quite frequently the lateral ventricle in the opposite hemisphere will be dislocated and its size also will be greatly modified. These changes in the ventricles, both homolateral and contralateral, yield many opportunities for locating brain tumors by ventriculography. Fortunately following the injection of air into one lateral ventricle, it is possible to obtain a roentgenogram of each lateral ventricle separately, and thus determine alterations produced by a tumor in either cerebral hemisphere. Owing to the angles of the ventricular system, it is possible to fill only one lateral ventricle with air when the head is in a given position. After a roentgenogram has been taken, the head must be carefully turned in such a manner that the air can pass the various ventricular angles and the interventricular foramina (of Monro) and the third ventricle, and thus reach the opposite lateral ventricle. After a lateral view of each ventricle has been photographed, the head should again be carefully turned in order to direct the air into the anterior horns of both lateral ventricles; the occiput will then be on the plate and the roentgenogram will give the size, shape, and position of the anterior part of both lateral ventricles. Then by placing the forehead on the plate, the size and position of the body, and of the posterior and descending horns, can be demonstrated. It would seem that most tumors must give some manifestations of their presence in one of these views, and the findings must therefore absolutely indicate the position of the tumor.

To introduce air into the ventricles of an adult, it is of course necessary to make an opening in the skull. This can be done either under local or general anæsthesia, the choice largely depending upon the patient. Personally, I prefer local anæsthesia with a responsive patient. The procedure need be but slightly painful and after transferring the patient to the X-ray room his co-operation eliminates respiratory movements and allows a much better exposure; moreover a considerable period of anæsthesia is avoided during the time necessary to dress the wound and transfer the patient to the X-ray room.

A ventriculogram will in many cases at once tell whether the tumor is cerebral or cerebellar. In the latter cases an internal hydrocephalus will be evident by the symmetrically enlarged lateral ventricles.

In some cases it will be found that the size of the ventricle has been so reduced that it is impossible to withdraw sufficient fluid to make the injection of air a safe procedure. It is then best to make a ventricular puncture on the opposite side and inject air into this ventricle, though occasionally both ventricles

[1] DANDY, W. E. Ventriculography following the injection of air into the celebral ventricles. Ann. Surg., 1918, lxviii, 5-11; fluoroscopy of the cerebral ventricles. Johns Hopkins Hosp. Bull., 1919, xxx, 29-33; roentgenography of the brain after injection of air into the spinal canal. Ann. Surg., 1919, October.

are too small. Not infrequently we can localize a tumor merely by the difference in size of the two lateral ventricles as determined by the ventricular puncture or often by the abnormal position at which either ventricle may be reached. In a general way a very small ventricle is presumptive though of course not absolute evidence of a cerebral as against a cerebellar tumor or a tumor of the brain stem; when there is a difference in the size of the two lateral ventricles the tumor is usually on the side of the smallest ventricle. Even a bilateral ventricular puncture, which is only occasionally necessary, is a small procedure compared to an exploratory craniotomy or even to a decompression, and the results obtained in localization of the growth not infrequently make the puncture far more valuable than an exploratory craniotomy. In infants and very young children, a puncture can be made through an open fontanelle or through sutures which have been separated by the abnormal pressure.

During the past six months I have used ventriculography in over seventy-five cases from Professor Halsted's clinic. The majority of these cases had hydrocephalus; in many cases ventricular dilatation was suspected and the injection of air made the diagnosis certain. In many others the injection was made in order to determine whether the disease was progressive or stationary, in other words, as a means to determine whether or not operative treatment should be instituted. These cases will not be considered here but will appear in a subsequent paper. I shall describe here only the instances of tumors in the cerebral hemispheres or for very strong reasons suspected of being located there, and only those in which the ventriculogram has been the *sole* means of diagnosis. In many cases the localization of the growth has been easily determined by signs and symptoms and in such instances there is at present no purpose in instituting ventriculography, though I feel that eventually this method may be important in differentiating the type of tumor and determining the kind of operative treatment which is necessary. This possibility is strongly suggested by two of the cases which will be described, but such a decisive stand in treatment, which in many cases might eliminate exploration of the tumor, will only be determined by an extensive experience in the interpretation of the X-ray findings in a large series of brain tumors.

Five cases are described here, each representing entirely different findings and showing the range of usefulness of this procedure when tumors of the cerebral hemisphere are suspected. Ventriculography will be seen to exclude a cerebral tumor when the lesion is situated elsewhere; precisely to locate the tumor when it exists in either cerebral hemisphere. In two of these cases there was no localizing sign by which the location of the tumors was even suspected. In both, the ventriculograms showed the precise location of the growth. In one case the tumor was entirely removed and the patient is now well; he had previously submitted to two exploratory craniotomies but the tumor could not be found. In the second case a decompression had been done; after localization of the tumor by a ventriculogram, a very large infiltrating glioma was found at operation but could not be removed. The patient was spared further useless operations by the ventriculographic localization of the tumor. In a third case the signs were differently interpreted; a large localized bulging in the right temple seemed to indicate an underlying tumor. There was a complete sensory and motor paralysis of the trigeminal nerve which could have resulted from pressure on the gasserian ganglion; or the paralysis might have been due to involvement of the trigeminal root in the posterior cranial fossa. The ventriculogram conclusively determined the location. In a fourth case, an exploratory craniotomy in a case of focal epilepsy disclosed a greatly dilated ventricle—apparently hydrocephalus; subsequently the ventricles were injected with air and the ventricular dilatation was found to be unilateral—a very rare condition. A fifth case can hardly be included as a result following ventriculography for air could not be injected, but the attempt at the procedure was responsible for locating the tumor. The ventricle was found by a ventricular puncture to be markedly dislocated to the left, but it was so small that only a few drops of fluid could

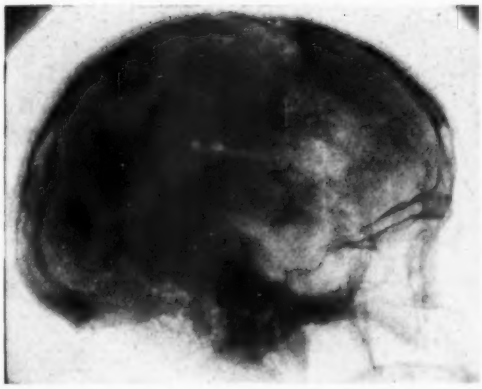

Fig. 1. Ventriculogram of a normal ventricle, lateral view.

be obtained from the needle. Under such conditions it is not safe to inject air. The dislocated position of the ventricle could only be caused by a tumor in the opposite side of the brain. The extremely small size of the ventricle must be due to the intracranial pressure produced by the tumor. The neoplasm was found in the right prefrontal region and completely removed.

LOCALIZATION OF A TUMOR IN THE OCCIPITAL LOBE, BY VENTRICULOGRAPHY

The difficulties and ofttimes the impossibilities of correctly localizing a brain tumor by the older methods and the simplicity of making the diagnosis by ventriculography will be seen in the observations which follow.

A sallow young man of 23, consulted me for disturbances caused by a tumor of the brain. The diagnosis of a cerebellar tumor had been made by one of America's foremost neurological surgeons and a cerebellar operation performed by him one year previously; the tumor was not found and consequently no relief was obtained. A year later he complained of constant headaches, with severe periodic exacerbations, and particularly of a progressive loss of vision. That the patient had a brain tumor was evident at a glance. A huge cerebellar hernia had followed the first operation and at once indicated a high degree of intracranial pressure. There was a bilateral choked disc measuring 6 diopters in each eye. But the position of the tumor was obscure. The only real objective finding was a complete deafness on the right side; bone conduction as well as air conduction was entirely absent. There was a suggestive Romberg; at times a slight fine

Fig. 2. Ventriculogram showing cross section of both lateral ventricles, also normal.

nystagmus, and a suggestive bilateral ataxia of the fingers. The patient insisted that the deafness followed the operation. He was sure of this because he had been in the telephone business and had used both ears equally well; moreover the deafness was noticed immediately after recovery from the cerebellar operation. The subjective symptoms were equally confusing and at that time could not be correlated into the results of a single intracranial lesion. His illness dated back 4 years, at which time severe attacks of bifrontal headaches and vomiting occurred periodically and steadily progressed in frequency and severity. Sixteen months ago diplopia appeared and after lasting for 2 weeks, disappeared and never returned. One month later the left half of the face became anæsthetic over night. He claims the left side of the face was paralyzed also. (He says he could not close the left eyelid and the left corner of his mouth drooped.) The sensory change was quite typically confined to the trigeminal area, ending sharply at the midline. The sensory (and motor) changes of the face lasted about two weeks. The left side of the face is still subjectively slightly numb, but there is no objective sensory or motor difference between the two sides. There was a sudden exacerbation of the headaches at the time of onset of these facial disturbances and vision then began steadily to diminish first in the left eye, later in the right. It is worthy of note that neither arm nor leg were affected at this time or subsequently. Two months after the onset of these symptoms, the previously mentioned cerebellar operation was performed. Four months later the patient had a convulsion

Fig. 3. Photograph of a young man from whom an encapsulated tumor was completely removed from the left occipital lobe. It is now two years since the operation. he is perfectly well and again at work. Prior to the successful operation two exploratory cerebellar operations had been performed, one elsewhere, the second by myself. The tumor was finally located solely by ventriculography. The succeeding photographs graphically show the trials undergone by the patient pending a correct localization of the tumor. The following ventriculograms demonstrate the simplicity of localization by air injection.

and remained comatose for 4 days. No localizing signs were noticed by anyone during the convulsion. The patient insists that following this period of coma the large occipital hernia which resulted from the operation almost disappeared and later gradually resumed its natural fullness and hardness. There had been a slight disturbance of gait with a tendency to stagger; but it was inconstant and the patient thought it no more than his general weakness could easily explain. No staggering had been observed by his friends. The visual fields showed great restriction of vision in both eyes. There was only slight vision for color in the left eye and this seemed to show a nasal hemianopsia; this was not considered significant because it was the terminal phase of color vision and the field of vision in the right eye showed no such form. A slight grade of convolutional atrophy was present in the skull, indicating that an intracranial pressure existed.

The problem then was how much reliance to place upon the patient's subjective sensations, which seemed paradoxical. It was difficult to see how a complete deafness could result on the right side from the operation as he had claimed. It was impossible to put much confidence in his assertion that the left side of the face was paralyzed (facial nerve). He might easily have thought his face was paralyzed because of anæsthesia; or as happens most frequently the facial paralysis, if present, may have been on the opposite side. As is well known patients and even physicians often mistake the side of facial paralysis. If the *left* trigeminal nerve (V) had been paralyzed, obviously the *right* auditory nerve (VIII) could not be destroyed by the same lesion. The patient could not by any possibility mistake the side which had been anæsthetic (cranial nerve V). If the facial nerve paralysis had been present and had been on the left side it seemed conceivable that a lesion in the left cerebellopontile angle could explain the anæsthesia and facial paralysis, but it would be necessary to disregard entirely the right auditory paralysis (nerve VIII) which he claimed had followed the operation. On the other hand if the auditory paralysis (nerve VIII) had resulted from the tumor and not from the operation a cerebellopontile tumor could explain it and also a possible right facial palsy (VII) but not the anæsthesia of the left side of the face (V). In either case it seemed most probable that the tumor was located in either cerebellopontile angle or possibly in a lobe of the cerebellum. To support this was the transient nystagmus, suggestive Romberg and ataxia, and possibly a slight staggering gait. Transitory hemianæsthesia of the face and facial paralysis are not uncommon in angle tumors. The absence of sensory or motor weakness of the arm and leg seemed to indicate that any facial paralysis must be a peripheral involvement of the facial nerve (VII) rather than involvement of the facial area of the pyramidal tract.

As a result of these deductions I was led again to explore the cerebellar region. It seemed either that the tumor might have been overlooked by the previous operator or that a tumor lying deeply in the cerebellum might by this time have grown nearer the surface. All these presumptions and analyses proved false. A thorough exploration of the cerebellar region and both cerebellopontile recesses revealed no evidence of a tumor. The foramen of Magendie was normal. The large hernia was mainly due to an enormous collection of cerebrospinal fluid, which of course would inevitably reform. Though greatly disappointed at the negative outcome of two big operations, the patient still hoped for a

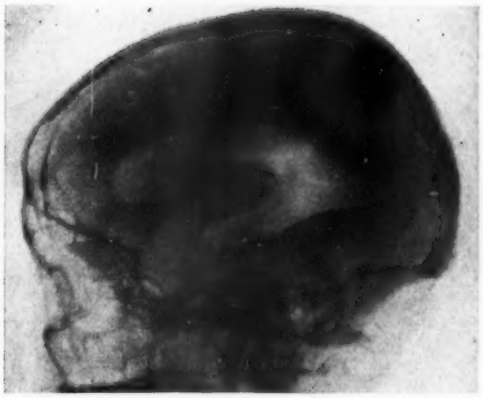

Fig. 4. Ventriculogram showing right lateral ventricle in patient shown in Fig. 3. The ventricle is probably slightly dilated.

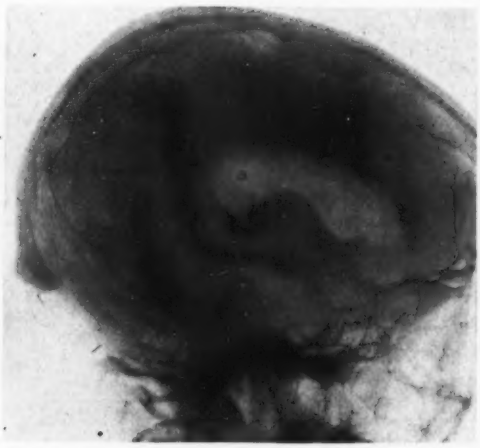

Fig. 5. Ventriculogram of left lateral ventricle of same patient. It will be seen that the posterior and descending horns of this ventricle are absent and that the body of the ventricle ends posteriorly in a very sharp convex line. The tumor has occluded the ventricle and fills the space posterior to the ventricular shadow (see dotted line). The sharp line of demarcation indicates an encapsulated and therefore removable tumor. *a*, Posterior part of the body of the ventricle.

diagnosis which we saw little hope of attaining. A ray of hope appeared in ventriculography, but its value at that time had not been tried. The procedure was mentioned as a possibility to the patient; its uncertainties and possible dangers were emphasized. He eagerly grasped the opportunity.

Seventy-five cubic centimeters of cerebrospinal fluid were removed from the right ventricle and an equal amount of air substituted. Roentgenograms of both right and left lateral ventricles were taken, first in profile and then in an anteroposterior view. The shape of the right lateral ventricle is normal although it may be slightly enlarged (Fig. 4). (The normal variations in size of the lateral ventricles have not yet been accurately determined.) The size of the left lateral ventricle was the same as the right but it suddenly ended near the middle of the body of the ventricle (Fig. 5). The anterior horn and the anterior portion of the body of the left ventricle were almost exactly like the corresponding parts of the right ventricle, but no air reached the posterior end of the body, the posterior horn or the descending horn of the left ventricle. These portions of the ventricle therefore threw no shadows and were absent in the roentgenogram. The air shadow terminated at a sharp curved line, with concavity directed forward. These findings could admit of but one interpretation —the tumor had completely occluded the body of the ventricle and had prevented the air reaching the posterior and descending horn. The tumor must, therefore, be situated in the left occipital lobe. The anteroposterior ventriculogram (Fig. 6) shows the left ventricle pushed toward the right and partially occupying the right half of the cranial chamber. The right ventricle is also dislocated farther to the right than its normal position. The anteroposterior ventriculogram alone would have shown the tumor to be in the left cerebral hemisphere, but the lateral view of the left ventricle disclosed the exact location of the tumor.

As a subsequent operation a craniotomy was performed directly over the tumor in the left occipital lobe (Fig. 9). An area of tumor about 1 by 1 centimeter reached the surface of the brain. After circumvection of the blood vessels, the cortex over the tumor was divided and the tumor readily shelled out of its bed (Fig. 8). It was perfectly encapsulated except at one point; here the tumor arose from the ependyma in the upper outer wall of the descending horn, near its junction with

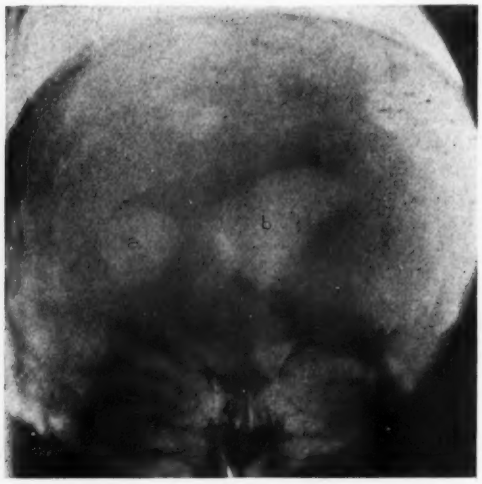

Fig. 6. Anteroposterior ventriculogram of same patient. Both ventricles are pushed far to the right side (the tumor is in the left occipital lobe). The left ventricle, *b*, is well over the mid-line and partially occupies the left side of the cranial chamber. *a*, Right ventricle.

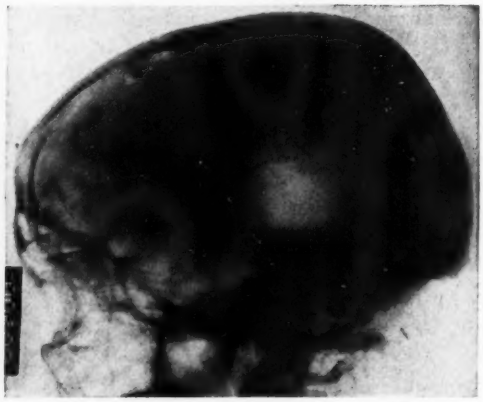

Fig. 7. The interior of the tumor contained a cyst which was accidentally punctured. The cyst was then filled with air. The roentgenogram shows the size and position of the cyst, and gives some idea of the position of the tumor. The solid part of the tumor extended to the surface of the brain, and the anterior and inferior limits extend somewhat beyond the cyst shadow. (See tumor outline in Figure 5.)

the posterior horn. It was, of course, necessary to open the ventricle widely and thoroughly resect the wall of the ventricle from which the tumor arose. The glomus of the choroid plexus had attached itself to the tumor. It was stripped away and left intact. The ventricle was apparently completely occluded by the intruding growth. The descending horn of the ventricle was definitely enlarged (localized hydrocephalus); the body of the ventricle was well over to the right of the midline exactly as the anteroposterior ventriculogram had indicated. The entire tumor with the wall of the ventricle was removed. It is now two years since the operation and the patient is perfectly well and at work. There has also been a marked restoration of vision.

In the light of the operative findings, it is now evident that the patient's history was largely correct, but I am still uncertain about the facial paralysis. The auditory nerve paralysis (nerve VIII) undoubtedly resulted in some way from his first operation. The sudden but transient attack of severe headache, vomiting, left trigeminal anæsthesia (nerve V) was due to a sudden occlusion of the ventricle by the ingrowing tumor. A left facial paralysis (nerve VII) could not by any chance have occurred. A right facial paralysis is conceivable from pressure of the localized hydrocephalus, on the face center of the pyramidal tract, but this hardly seems probable. He probably mistook the anæsthesia for motor paralysis. The block in the ventricle had produced an acute hydrocephalus localized to the descending horn of the ventricle (because the ventricle is situated distal to the obstruction). This sudden localized hydrocephalus compressed the gasserian ganglion or the three branches of the ganglion, producing the left trigeminal anæsthesia. The tumor was situated too far posteriorly to have produced *direct* pressure on the gasserian ganglion. A channel in the ventricle subsequently opened and the sensory and possibly motor paralyses were relieved to a great extent. The enlargement of the descending horn is now understood, for there is only one outlet for the cerebrospinal fluid in the descending horn and that is into the body of the ventricle.

DIFFERENTIAL DIAGNOSIS BETWEEN A TUMOR IN THE TEMPORAL FOSSA AND THE CEREBELLOPONTILE ANGLE

The above localization of a cerebral tumor when a cerebellar neoplasm is suspected, has a counterpart in the following diagnosis of a

cerebellar tumor when a temporal lobe tumor is suspected. At least there are very valid reasons for the differences of opinion in the diagnosis.

A girl of 13 had suffered from headaches most of her life, but during the past 3 years they had become gradually more violent. There were numerous spells of projectile vomiting. Since childhood a large swelling in the right temple had caused a marked facial disfigurement. Diplopia had been present at times. Only recently signs of cerebellar involvement had appeared. There was a definite Romberg with tendency to fall to the right; staggering gait with tendency to waver toward the right; a slight but definite ataxia of the right hand; a slight diminution in hearing on the right; adiadochocinesia, and nystagmus. All these were outspoken objective evidences that the cerebellum was involved. There was a bilateral choked disc which measured six diopters in each eye. But the outstanding features of the case were the large boss in the right temporal region (Fig. 12) a complete sensory and motor paralysis of the fifth nerve and a right facial paralysis which was also nearly complete. The boss and the anæsthesia had been present for several years. The masseter and temporal muscles were completely atrophied on the right side there being no muscular response whatever; the anæsthesia over the entire trigeminal area was complete Taste was lost on the anterior two-thirds of the tongue. The right corneal reflex was absent. There was no hemianopsia, but a general restriction of the visual fields and of the visual acuity. Hearing was present but less acute on the right. There were two possible locations for the growth and plausible reasons for each diagnosis. During the previous three years she had been to two very prominent surgeons, each of whom had wished to remove the tumor mass from the temporal region. They thought the growth was a bony tumor which had originated there, and in its later growth had projected into the cerebellar fossa, producing the cerebellar signs of comparatively recent onset. There were three very good reasons for this diagnosis. First, the large local protuberance had all the appearance of a tumor; second, the complete paralysis of the trigeminal nerve and its long duration before the more recent involvement of the other cranial nerves particularly the facial nerve (VII), and the auditory nerve (VIII) which arise very close to the fifth nerve. The complete fifth nerve palsy (V) could easily be explained by direct pressure of the presumed tumor of the middle cranial fossa on the gasserian ganglion, especially since the trigeminal paralysis had been present for years and was complete. The X-ray showed increased density in the right parietal region; this was definite but not sufficiently pronounced to be a primary tumor of the bone; if a tumor at all it could only be an underlying soft tumor of the brain. On the other hand the assumption of tumor in the region of the gasserian ganglion or

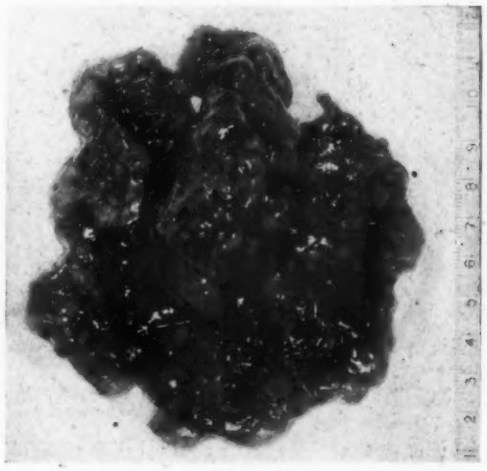

Fig. 8. Photograph of the tumor which was removed from the occipital lobe. See preceding figures. The tumor arose from the ependymal lining of the wall of the descending horn (upper part) of the ventricle. A view of the entire lateral ventricle was easily obtained during the operation.

elsewhere in the middle cranial fossa, rendered the explanation of the cerebellar signs difficult. Only an extension of the tumor through the tentorium cerebelli into the posterior cranial fossa could produce the cerebellar signs Such an extension of a tumor may indeed occur but it is quite exceptional. On the other hand if the origin of the tumor was in the region of the cerebellum, how could one explain the large unilateral boss in the temporal fossa? It could only be said that occasionally in hydrocephalus, there is a localized bulging in the temporal fossa, but I have never seen one so prominent. Such an explanation of course presupposed a hydrocephalus which was not known to exist and it further assumed that the hydrocephalus dated back to early childhood when the skull was very plastic. The head was possibly slightly larger than normal. The swelling had been present as long as the parents could remember, but they thought it was still growing although very slowly. Paralysis of the temporal and masseter muscles accentuated the prominence of the swelling but could not explain it as relative rather than actual.

The solution of the confusion in the diagnosis lay in the presence or absence of an internal hydrocephalus. If an internal hydrocephalus was not present the boss in the temporal region would probably be due to a tumor in that locality and the right lateral ventricle would probably show signs of dislocation or compression from the tumor. On the other hand if a hydrocephalus was

Fig. 9. Patient shortly after the tumor was removed. The large bulging in the suboccipital region followed the first cerebellar exploration which was done elsewhere. The size of this hernia has now greatly lessened but the separation of the muscles will prevent its total disappearance. The anterior curved incision was made directly over the tumor.

present it could not have resulted from a tumor in the temporal fossa but the tumor must have been situated in the posterior cranial fossa. Except in rare instances, only tumors in the brain stem or cerebellum can produce a symmetrical bilateral internal hydrocephalus.

The entire operative procedure for relief of such a case was dependent upon the ventriculogram. The ventricles were found by ventriculography to be greatly and equally dilated. Unfortunately the patient was in the terminal phase of pressure when she arrived and her condition did not warrant a cerebellar operation. A subtemporal decompression would have accomplished nothing beneficial but would no doubt have ended fatally. At necropsy the tumor was found in the cerebellar region as indicated by the internal hydrocephalus shown in the ventriculogram. It was an invasive glioma probably of congenital origin. No doubt the tumor had remained comparatively dormant for years and then resumed a sudden activity. The high grade of hydrocephalus and the corresponding reduction in the cerebral cortex are well demonstrated in the ventriculogram (Fig. 13).

In both this case and the one preceding the tumor could not be located by the usual methods. In the first case two operations were performed in the wrong location because of misleading signs and symptoms. In the second, two surgeons wished to operate on the temporal region and were prevented only by the patient's hesitancy to undergo the operations. I thought the tumor to be in the cerebellar region but the diagnosis could not be certain; others regarded the tumor as in the middle cranial fossa instead of in the posterior cranial fossa. Although a very high grade of hydrocephalus existed, only the ventriculogram could prove it. In both cases the ventriculogram alone was decisive.

LOCALIZATION OF AN INOPERABLE SUBCORTICAL CEREBRAL TUMOR

Another instance of a brain tumor clinically unlocalizable, but clarified by the ventriculogram was a man aged thirty-seven.

His symptoms were rather fulminating—headache and vomiting of only three months' duration. A bilateral choked disc of 4 diopters was the only possible objective finding. A subtemporal decompression had been performed by Dr. Heuer but the tumor grew so rapidly that the decompression had ceased to be of value in less than a month. A right ventricular puncture was then made under local anæsthesia. Because of the extreme intracranial tension which was indicated by a very tight decompression I was afraid of acute pressure symptoms and injected less than 30 cubic centimeters of air which was sufficient to fill only the descending horn of this ventricle (Fig. 10), but the size of the left ventricle (Fig. 11) was so reduced that the injected air was ample to fill it entirely. The ventriculogram therefore indicated a normal right ventricle and a left ventricle greatly and fairly uniformly reduced in size. The various horns of this ventricle were about equally affected. The anterior horn, however, was pushed backward and downward by the tumor. Later a left craniotomy was performed and the tumor was found to be a very extensive infiltrating glioma but coming to the surface in the frontal region. The surface compression of the convolutions suggested an extensive subcortical involvement

Fig. 10. Ventriculogram of right lateral ventricle of a patient with an unlocalizable tumor of the brain. Only the descending and posterior horns, *a*, of this ventricle are filled with air. The contour of the remainder has been projected in a dotted line, *a'*, to contrast with the opposite side. There is no occlusion in the ventricle because the air passed freely to the opposite side. (See Fig. 11.)

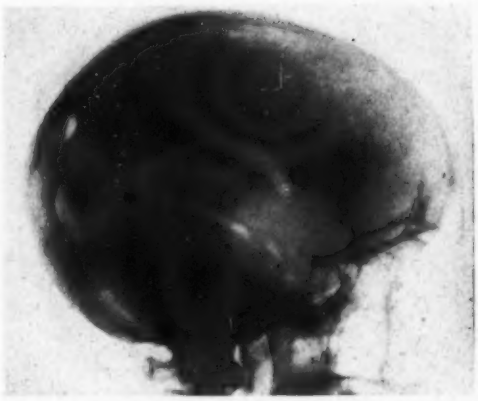

Fig. 11. Ventriculogram of left lateral ventricle (right shown in Fig. 10). The size of this ventricle is greatly reduced in all of its component parts, due to pressure of a large tumor. The anterior horn, *a*, is also pushed downward and backward. The contrast between the size of this ventricle and that on the right (Fig. 10) is striking. The same quantity of air which filled only the posterior and descending horns of the right ventricle filled the entire left ventricle and part of the third ventricle. (The foramen of Monro can be seen at the junction of the third and lateral ventricles, *b*.) The tumor was found at operation. It was an infiltrating glioma and too extensive to permit removal. The circular zone in the roentgenogram is the defect in the bone produced by a subtemporal decompression. *c*, Posterior horn of ventricle; *d*, descending horn of ventricle.

of the frontal and temporal lobes. The tumor was too large to attempt removal, but an extra large decompression was left further to alleviate his symptoms.

UNILATERAL HYDROCEPHALUS DEMONSTRATED BY VENTRICULOGRAPHY

During a recent craniotomy for Jacksonian epilepsy in a child of six years I was surprised to find what seemed to be a large cyst in the right post-Rolandic region.

On incision this cyst proved to be a huge lateral ventricle. The posterior horn and the descending horn had lost their normal configuration because of the tremendous distention. There had been no reason to suspect an internal hydrocephalus; the eye-grounds were normal; the roentgenogram of the head showed no signs of intracranial pressure. There was a distinct abnormality of the surface of the brain. Extensive obliteration of both the cerebral arteries and veins in the parietal and occipital lobe had left a pale white, soft cortex posterior to the Rolandic fissure. Numerous tiny new arteries passed through the meninges, apparently a recent and new development to replace those which had been destroyed.

For months prior to the operation and since the onset of the Jacksonian epilepsy, the patient had had a high irregular fever, a marked tachycardia and at times had been comatose. Apparently there has been an extensive vascular thrombosis at this time.

After convalescence from the operation, permission was obtained from the parents, to inject air into the ventricles for ventriculographic observations. The results of these studies are graphically shown in the accompanying ventriculograms. The hydrocephalus is unilateral, a most unusual condition. The left ventricle is of normal shape (Fig. 15,*a*), its size somewhat larger than normal though I have not had a sufficient number of normal ventricles to tell how large the normal variations may be. The right ventricle is a tremendous cyst (Fig. 14 and Fig. 15, *b*) but the enlargement is principally posteriorly, where the vascular affection was most pronounced. In the strict sense this cannot be a true hydrocephalus, for there is, at least now, no increased intracranial pressure. The unilateral dilated ventricle is undoubtedly due to softening of the cerebral walls from the vascular disturbance. The softened area atrophied from the pressure in the ventricles. In a true

Fig. 12. Photograph of patient who had cerebellar signs and symptoms but a large swelling in the right temporal region. This was regarded as the tumor by the surgeon who advised removal. The ventriculogram (Fig. 13) explains the swelling to be secondary to an internal hydrocephalus.

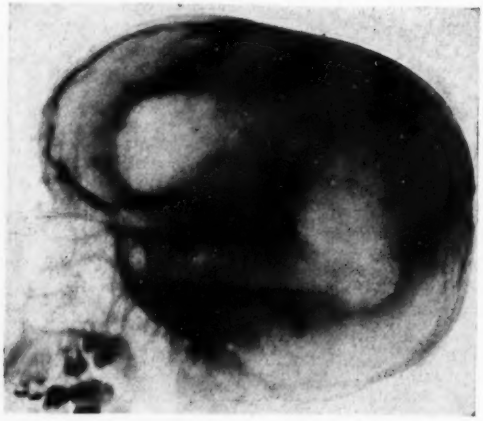

Fig. 13. Ventriculogram of lateral ventricle of the patient shown in Fig. 12. A high grade of internal hydrocephalus was conclusive evidence that the tumor was in the cerebellar region. The unilateral swelling in the temporal region was secondary to the hydrocephalus.

unilateral hydrocephalus the foramen of Monro must necessarily be occluded. At a subsequent operation I removed the choroid plexus from the dilated ventricle and occluded the foramen of Monro by a transplant of fascia as I have done on animals, following Professor Halsted's suggestion. There was immediate cessation in the attacks but this phase of the story will be considered in a subsequent paper.

The condition in this case could not have been known, even after the operation, without a ventriculogram. In fact a ventricular puncture and a roentgenogram would have given the same information without the exploratory craniotomy, and the first operation might have been spared the patient.

LOCATION OF A CEREBRAL TUMOR BY VENTRICULAR PUNCTURE WHEN THE VENTRICLE IS TOO SMALL TO PERMIT THE INJECTION OF AIR.

In some cases of brain tumor, possibly due to a very rapid growth of the tumor, the size of the ventricle on the side of the tumor and at times even of the contralateral ventricle is so reduced that only a few drops of fluid can be obtained by a ventricular puncture. In these cases enough fluid cannot be aspirated safely to permit the injection of the air for the purpose of obtaining a ventriculogram. If air should be injected under such conditions, an acute rise of intracranial pressure might follow, possibly with disastrous results. But in these cases there is usually a definite dislocation of the ventricle; this is frequently great enough to cause difficulty in locating the ventricles by a puncture. But when the ventricle is found, its position may explain the the location of the tumor.

A young woman of 24 was suffering from a rapidly growing intracranial tumor. The signs and symptoms gave absolutely no clue to the location of the growth. Pursuant to our newer conception of the importance of an early localization of the growth, I made a right ventricular puncture and found the ventricle dislocated toward the left side, but only three or four drops of fluid escaped from the needle. Since air could not be injected under these circumstances without risk, a ventricular puncture was at once made on the left side but the left ventricle was no larger and despite the high grade of intracranial pressure (6 diopters swelling in each optic disc) only a few drops of fluid escaped

Fig. 14. Ventriculogram showing tremendous cyst-like dilatation of one lateral ventricle. The patient was operated upon for focal epilepsy.

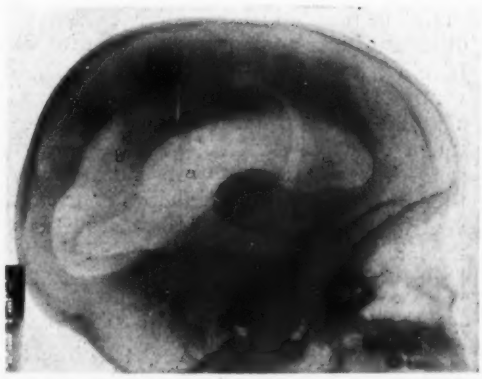

Fig. 15. Ventriculogram of opposite lateral ventricle which is much smaller. Some air is still present in the large ventricle, the outlines of which are superimposed. The operative defect in the skull is also visible.

and no more could be aspirated. This ventricle also was dislocated markedly to the left. It was evident that the tumor must be in the right cerebral hemisphere and that it had pushed both lateral ventricles toward the left; however, the exact localization of the tumor on the right side could not be made in any way. In view of these findings a right exploratory craniotomy was performed and a large extracortical circumscribed tumor completely removed from the right frontal lobe. The patient recently left the hospital perfectly well.

CONCLUSIONS

1. Ventriculography is invaluable in the localization of obscure brain tumors. So-called unlocalizable tumors comprise at present over half of the total number.

2. Practically all brain tumors either directly or indirectly affect some part of the ventricular system.

3. Hydrocephalus is easily demonstrable by ventriculography and when present usually though not always restricts the location of the tumor to the posterior cranial fossa—that is, the brain stem or the cerebellum.

4. Local changes in the size, shape, and position of one or both ventricles as shown by the ventriculogram will accurately localize most obscure tumors of either cerebral hemisphere.

5. Every effort should be made to localize the tumors before resorting to any operative procedure.

6. The usual subtemporal decompression is useless and dangerous when a hydrocephalus is present, that is when the tumor is in the brain stem or cerebellum.

7. A suboccipital decompression (cerebellar operation) is extremely dangerous when the lesion is in the cerebral hemispheres.

8. To differentiate between cerebral and cerebellar lesions is frequently one of the most difficult tasks in intracranial localization. Ventriculography at once separates these two groups and indicates the operation of choice.

9. The only cure for brain tumor is extirpation. The results in terms of complete cures of brain tumors will be in proportion to the early localizations which are made. A decompression is a purely palliative procedure and should be adopted only when the tumor cannot be located. Ventriculography permits of an early and accurate localization of the growth when all other methods fail.

10. It is possible to get a separate profile ventriculogram of the whole of each lateral ventricle. Any change in size or contour is easily demonstrated. Anteroposterior views will show the same points in cross section but they are chiefly useful in showing any lateral dislocation of the ventricles.

11. The results in localization of five types of cases of brain tumor are shown with ventriculograms. In all but one of these, the ventriculogram was the only means by which a positive localization could be made. One tumor occluded a lateral ventricle and dislocated both lateral ventricles. Another tumor altered the size and shape of one lateral ventricle. In a third case a cerebral tumor, though suspected, was eliminated by the hydrocephalus. In a fourth case a unilateral hydrocephalus was demonstrated.

12. Occasionally the size of both ventricles is so reduced that air cannot be safely injected. In one case the dislocated position of both ventricles, which were greatly reduced in size, made the localization possible.

13. Ventriculography is also useful in *precisely* localizing the growth. This permits of an exploration *directly over the tumor* and greatly simplifies the operative procedures.

14. Many useless and harmful operations will be spared the patient by a judicious use of ventriculography.

15. Doubtless the type of tumor will often be indicated by the ventriculogram. Such knowledge will be useful in prognosis and in determining whether radical or palliative operative treatment should be instituted. These determinations will result from accumulated experience in the interpretation of the ventriculograms together with the correlative operative findings presented in a large series of cases.

16. With experience and care in the use of ventriculography, I believe few tumors will escape accurate localization.

NOTE.— The accompanying ventriculograms were taken by Miss Mary Stuart Smith from Dr. Baetjer's department. The shadows have been very slightly accentuated by Mr. Broedel to overcome the loss of detail in reproduction. The original X-rays are just as sharp as the figures as they are here reproduced.

AN EXPERIMENTAL STUDY OF URETERAL LIGATION; DEMONSTRATION OF LATE RESULTS TO URETER AND KIDNEY[1]

By JOHN R. CAULK, A.M., M.D., and R. F. FISCHER, M.D., St. Louis

A PRELIMINARY report on ureteral ligation was given before this Association in 1915, the basis of the report being the discussion of a patient on whom both ureters had been ligated during a hysterectomy for fibroids, and who had passed no urine for eight days. It was recognized early that the ureters had been tied, but the surgeon awaited developments, thinking that possibly the catgut would loosen and the ureter would open spontaneously. At the end of the eighth day the patient became uræmic. At this time I saw her and advised double nephrostomy, which was acceded to and done with very little disturbance to the patient and with the result that during the next twelve hours over 100 ounces of urine were secreted, the analysis of which showed a specific gravity of 1007, a trace of albumin and the sediment to contain granular and hyaline casts and red blood cells. Drainage through the nephrostomy tubes was free until the fifty-eighth day, when the patient voided. Ten days later the urine was passed entirely by the bladder and the wound had healed.

At this time the patient's condition was good, but the kidney function as determined with phthalein was quite low. Since then I have watched this patient with great interest. She is in excellent health, and her renal function has returned to normal limits. This observation clearly demonstrates that kidneys which have been completely obstructed for 8 days are capable of promptly resuming their function after drainage. This has been experimentally shown in the recent works of Keith and Pulford, and of Johnson. Furthermore, it establishes conclusively the fact that ureters which have been ligated with absorbable material may eventually open and drain sufficiently to allow closure of the nephrostomy wound, with the resulting complete restoration of health to the individual and without evidences of late ureteral obstruction.

Besides this case we have seen a number of instances of this complication of pelvic surgery; one other double, and several single involvements. We believe that this complication occurs more frequently than is supposed. Barney has collected 62 cases of occlusion during pelvic operations. Of these, 46 were unilateral and 16 bilateral. Kelly and Burnam state that ligation is the most frequent complication of the ureter during pelvic surgery. In this paper we will confine ourselves strictly to ligations and wish it to be clearly understood that ureteral severance is

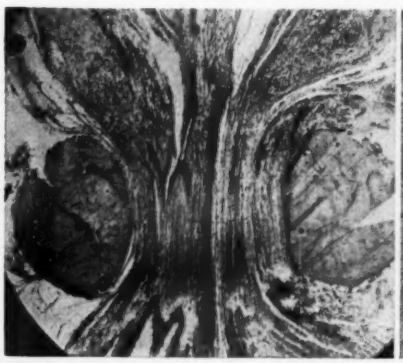

Fig. 1. Ureter at site of ligation. One hour.

Fig. 2. Five weeks.

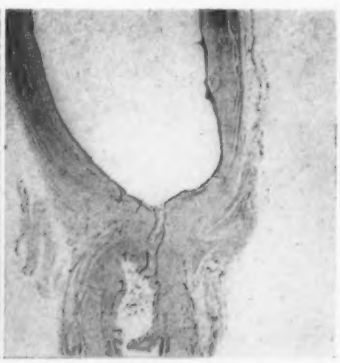

Fig. 3. Six weeks.

[1]Read before the American Association of Genito-Urinary Surgeons, June 16, 1919.

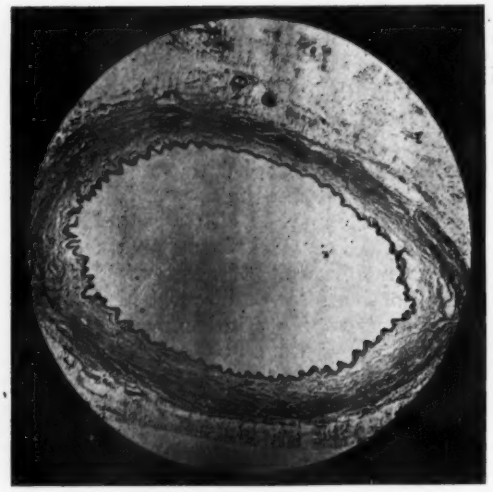

Fig. 4. Ureter above ligation.

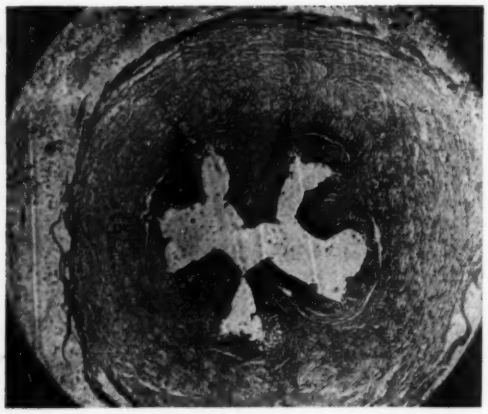

Fig. 5. Ureter below ligation.

not under consideration. The bilateral cases, of course, manifest themselves by anuria, and demand urgent relief, whereas a unilateral ligation, owing to either complete absence or a great paucity of symptoms may not attract the surgeon's attention to the possibility of renal occlusion.

The clinical cases which we have observed stimulated us to undertake an experimental investigation of this important point. Our preliminary report dealt only with the immediate effects of such ligations and bore chiefly on the subject of double ligation in which urgent measures are indicated in order to save the life of the individual. We wish now briefly to summarize our previous findings and to append our observation on the late results.

Experiments were done entirely on dogs, and in all 70 animals were used. The pathological specimens have been demonstrated to the American Urological Association at its meeting in St. Louis and to the Society of Clinical Surgeons. At present we will not give a detailed protocol of all the experiments, but for the sake of brevity will summarize our findings. The problem before us appeared to be as follows:

In case of double ligation, is it better to deligate the ureter, to do a ureterovesical anastomosis, or a double nephrostomy in the hope that the ureters will finally open and the kidneys be saved? Inasmuch as the idea seems current that catgut, the ligature usually employed, will be absorbed sufficiently within a few days to allow the ureter to open, we endeavored first to determine the time necessary for the absorption of No. 2 plain catgut (Fig. 1); second, if the ureter after such ligation would finally open, and the manner in which this opening occurred; third, the length of time required for it to open; and lastly, the renal complications at various intervals following sudden occlusion of the ureter.

Our experiments consistently showed that No. 2 plain catgut was never absorbed before the end of three weeks. In other words, it would be futile to wait for the catgut to be absorbed before attempting to save the kidney.

Granting that the catgut would not be absorbed before the death of the individual in the case of double, or before almost complete, destruction of the kidney in the case of single ligation, one of the three procedures just suggested, namely, deligation, ureterovesical anastomosis, or nephrostomy, must be adopted. The ideal method, of course, would be immediate deligation, but such an operation would seem to be attended with considerable difficulty, inasmuch as searching for a tie on a ureter deep in the

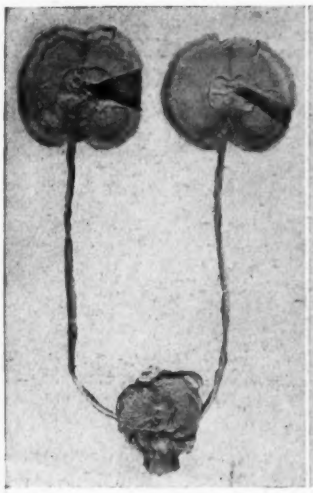

Fig. 6.

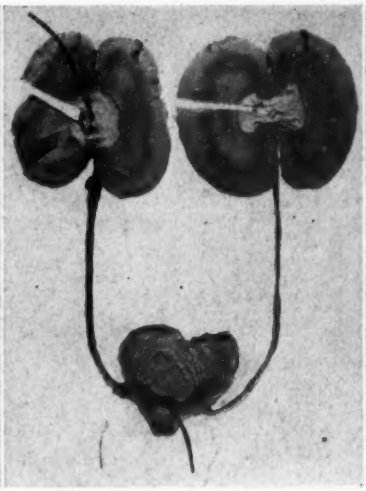

Fig. 7.

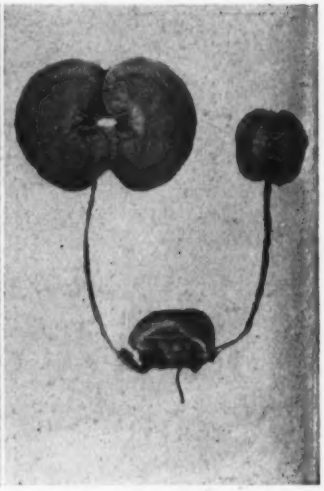

Fig. 8.

Fig. 6. Deligated right ureter at end of 1 year.
Fig. 7. Right kidney and ureter at end of 1 year. Nephrostomy fourth day; tie left on ureter. Notice open ureter.
Fig. 8. Kidney atrophied at end of 1 year. No nephrotomy; ureter open.

pelvic cavity several days after an extensive resection, is a problem attended with considerable difficulty. Even in animals we have had trouble in removing the ligature, owing to its being buried within the ureteral wall, and in a fair proportion of the experiments our attempts to deligate without cutting the ureter, in spite of our strictest attention, were unsuccessful. In several instances in which I have known of its being done clinically, the ureter has been incised with a resulting fistula, or a ureterovesical anastomosis performed at the time.

Such anastomoses at best are not entirely satisfactory and are frequently attended with contraction and obstruction, and certainly are difficult under the circumstances. Furthermore, the danger of hæmorrhage must be considered since the ligature which implicates the ureter also includes within it the uterine vessel.

Faced with these difficulties and occasional dangers, we undertook the problem above described and found, as some of you will remember, that the first indication of the formation of a lumen through the site of ligation occurred at the fifth week (Fig. 2). There was at this time a budding out of epithelium both from above and below, growing toward each other, and a definite column of epithelial cells joining them. We also noticed a beginning lumen which seemed to funnel from above. At the end of six weeks the canal had found its way through the connective tissue and had opened sufficiently to allow fluids to be injected through (Fig. 3). We will not describe in detail the preparation of specimens or the pathological change in the ureteral wall above and below the ligature, as they were given completely in the previous report.[1]

At the end of 8 weeks the ureteral lumen is fairly well opened and while the gross specimen

[1]Tr. Am. Ass. Genito-Urin. Surg., 1915.

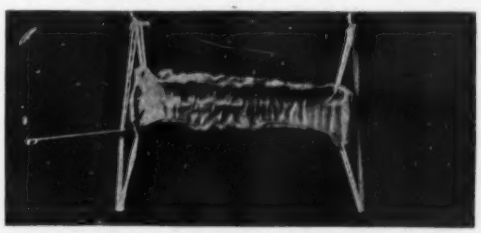

Fig. 9. Section of ureter at 7 months. Notice open lumen at site below.

Fig. 10.

Fig. 11.

Fig. 12.

Fig. 10. Right ureter ligated 1 week.
Fig. 11. Right ureter ligated 1 week, but kidney drained third day.
Fig. 12. Same as Fig. 11. Section.

seems to demonstrate that the site of ligation is considerably restricted, it is universally found that this is more apparent than real, as far as the lumen of the ureter is concerned, since the proportionate size between the lumen of the lower ureter and of the compressed ureter is not as much at variance as the ureteral wall would indicate. At 12 weeks the lumen is more open and there is much less pronounced constriction. The wall of the ureter in this segment is thinner and composed of delicate connective tissue, etc.

We have several animals which have gone a year following the ligation. Those which were nephrotomized and in which we were successful in keeping the drainage tube in the kidney in place for several weeks, have remained healthy and well; the kidney sinus has subsequently closed and at autopsy at the end of this time, the kidney on the side corresponding to the ligation has been remarkably well preserved, in striking contrast to the kidney which was not drained behind the obstruction. (In such a case there is, of course, complete atrophy. Figs. 6, 7, 8.) The lumen of the ureter is open and free (Fig. 9), and a No. 6 catheter passes easily, but the ureter itself is shorter and thicker than a normal one.

The ultimate opening of a ureter following a protracted ligation serves as a demonstration of the amount of damage a ureter will tolerate without the production of a pronounced stricture. It also confirms my strong belief that ureteral strictures are not as frequent as one is led to believe; that the majority of them are spasms in the neighborhood of inflammatory processes. This can be beautifully demonstrated, clinically, by the administration of repeated doses of atropine to patients who seem to have a ureteral stricture, whereas they can frequently be easily catheterized with a large catheter after atropine, notwithstanding their previous impermeability.

Effects upon the kidney. We shall not consume time in giving the detailed findings of the kidney complications secondary to complete ligation of the ureter as they were thoroughly described in the previous paper, and have been fully studied by Lindemann, Sollmann, Williams, Legueu, Cohnheim, Pierce, and beautifully illustrated by the splendid work of Barney, which was presented before this association; more recently by

Fig. 13. Ureter ligated two weeks. Marked hydronephrosis.

Reid, by Keith and Pulford, and by Johnson. I wish to refresh your memories, however, by showing illustrations of the various degrees of renal involvement at different intervals following the obstruction (Figs. 10 to 15), in order to demonstrate how essential it is that prompt attention be paid to the ligation if there is to be hope of saving the kidney. It should be noted that dilatation of the ureter and kidney pelvis start fairly promptly after the ligation. Reid's work seems to show that the first dilatation is just above the site of ligation. We have not in our experiments seen it confined so definitely to the lower part, but have found it to be general throughout the ureter and kidney pelvis. As you can see from the sections, there are various grades of hydronephrosis up to the fourth or fifth week, at which time the kidney is seriously damaged, and often nothing of the cortex left but a shell (Figs. 14 and 15).

The ureter in all of these ligations has been tortuous, which explains why ureteral catheterization may be impossible even though the ureter has opened. Thus it seems evident that if one hopes to conserve the kidney the obstruction must be relieved, certainly within two weeks, as after that it may be irreparable. This has recently been demonstrated by Johnson who has shown that the functional test may return to normal in an animal whose kidney has been obstructed for no

Fig. 14. Ureter ligated 4 weeks.

longer than two weeks. The longer the period of obstruction the slower the rate of recovery.

In a series of experiments which have been done to determine the nitrogen content of the blood following single ligation of the ureter, we have found that in some of these animals there is a gradual rise of the blood nitrogen content until the time the kidney is drained — which was usually the fourth day. Following this, there is a sudden rise, in some instances, but usually a very slight one. Then within 2 to 4 days after drainage the blood nitrogen drops to normal and remains so if the drainage is sufficient.

This restoration of function after a prolonged obstruction has an important clinical significance, and demonstrates to us how careful one should be in suggesting nephrectomy to patients whose kidney function may be extremely low in the face of retention. We should always try to relieve the retention conscientiously before attempting to sacrifice a kidney, as so frequently kidneys which

Fig. 15. Same as Fig. 14.

Fig. 16. Kidney at end of 6 weeks.

seem functionally hopeless have been restored after retention is relieved. Therefore, clinically, we must relieve a kidney of complete retention before the end of 2 weeks.

In double ligation, of course, one should drain promptly after the ligation is appreciated in order to save the life of the individual. In single ligation, however, the problem presents a different aspect. In this instance the life of the kidney alone is to be considered. Shall we allow the kidney to die unmolested, or shall we exert every effort to protect it? The difficulties in this phase of the question are manifold. In the first place since the symptoms may be insignificant, many ligations may pass entirely unappreciated both by patient and surgeon. If they are recognized and appreciated, the surgeon is confronted with these questions: Shall he propose to his patient that there is a surgical complication which she may never become aware of, and which may probably disturb her health but little if at all, if left unrelieved; or shall he suggest another operation which though attended with some risk and more suffering, will in all probability give her much greater renal capacity? Again, is there danger that another operation, several days after pelvic surgery, would be too hazardous? Are the results that we can offer commensurate with the danger and difficulties of the problem; and which phase of the problem presents itself as the most suitable avenue of approach for the ultimate relief of renal embarrassment and restoration of health?

We shall attempt to answer these questions in our summary. We feel entirely convinced that catgut will not be absorbed rapidly enough to protect a kidney against complete destruction, so that in double ligation a prompt response is necessary after the appreciation of a ligation. Our experiments and clinical observations seem to indicate that a ureter which has been ligated with catgut will eventually open sufficiently to allow complete drainage from the kidney, and that this opening takes from 6 to 8 weeks or more, during which time a kidney will be completely destroyed unless protected by drainage, either through the kidney or through the ureter.

Faced with the difficulties of deligating a ureter, such as reopening an abdominal wound and searching for a small tie in a pelvis imbedded with plastic exudate, and the ureter incorporated with the uterine vessels, with the consequent danger of hæmorrhage and the possibility of cutting the ureter with a resulting fistula — certainly a much more serious operation than a double nephrostomy — and with the same difficulty attending a ureterovesical anastomosis (with

the exception of hæmorrhage), we are of the firm belief that the safest method of protecting the individual is an immediate double or single nephrostomy.

We are impressed that dealing with single ligation, such as we propose, may not have as large a field of usefulness as it merits. In the first place, the diagnosis of single ligation may prove difficult, as the symptoms may be slight. If, however, a woman who has undergone pelvic operation complains of pain in the kidney, which is usually about the third day, and this kidney is found to be enlarged and palpable, not having been so beforehand, such symptoms are highly suggestive of ureteral ligation. If the patient's condition would warrant it, a ureterogram would clinch the diagnosis. It is then for the surgeon to decide whether it is better for the patient to allow the kidney to die or to try to protect it. It seems certain that no reputable surgeon would be embarrassed in making this situation known, provided there is a fair chance of saving the kidney. The danger of a unilateral nephrostomy should be extremely slight, as it can be done under local anæsthesia and certainly quickly under gas.

With such a fair chance of the ureter opening and the kidney healing in good condition, we believe that this should be the procedure. Granting that it may not be successful, even then the patient's ultimate condition is as good as it would have been had the attempt not been made, and we would have fulfilled our chief urological duty, namely an attempt to conserve the renal parenchyma.

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ABNORMALITIES RESULTING FROM THE REMAINS OF THE OMPHALOMESENTERIC DUCT

Report of Two Cases

By MOSES BARRON, M.D., Minneapolis
From the Department of Pathology, University of Minnesota

A MALE child, G. W., age 5, was admitted to the University Hospital on November 12, 1916, complaining of a persistent discharge from the umbilicus. The mother stated that she first noticed a slightly raised, raw surface at the navel several weeks after the birth of the child; nothing abnormal was seen at the time when the cord dropped off. A little later, a slight, bloody, odorless discharge appeared which irritated the skin immediately surrounding the umbilical depression. This condition persisted.

Examination at the hospital showed the presence of a small polypoid mass of granulation tissue at the umbilicus. This was bathed by a thin, blood-tinged, serous exudate. The surface of the mass was smooth and velvety and bled readily. The base was attached to the umbilical floor. There was no opening present on the surface, and neither fæces nor urine could be detected in the secretion. In order to determine whether a fistula existed at this point, the patient was given methylene-blue by mouth. Examination of the exudate revealed no trace of the dye.

The parents refused all operative procedures at this time, and the child was discharged from the hospital, unimproved, on November 21, 1916. When the parents realized that the condition was not getting any better, they brought the child for readmission on April 11, 1917. On April 14, the navel was excised through an elliptical incision. The peritoneal surface opposite the depression was smooth and showed no attachments. Healing of the operative wound was rapid and complete.

The specimen removed showed a bright red, velvety, pear-shaped mass (Fig. 1) attached to the lower margin of the umbilical depression by a broad base. The polyp measured 5 millimeters in diameter and 9 millimeters in length. In appearance it resembled exuberant granulation tissue. The surface was covered with a seromucous exudate.

A microscopic section at once made clear the true nature of the polyp. A section through the long axis showed dense bundles of hyalinized connective tissue at the base (Fig. 2). The mass proper revealed two distinct layers—an internal core consisting of irregular bundles of smooth muscle fibers and connective tissue, and a peripheral or glandular zone about 1 millimeter in thickness strongly resembling the mucosa of the intestine (Figs. 3 and 4). The surface was covered with a tall non-ciliated columnar epithelium. Villous, club-shaped masses projected from the surface. These were composed of loose connective tissue infiltrated with numerous leucocytes (eosinophiles, plasma cells, lymphocytes, and polymorphonuclears). Very many thin-walled blood vessels were present. The gland tubules, which composed this zone, opened on the surface between the villi. The tubules were lined with a single layer of low columnar epithelium and terminated in blind extremities deep in the loose connective tissue close to the muscular layer. The cells were sharply outlined; the cytoplasm took the basic stain; the nuclei stained deeply and were situated at the bases of the cells (Fig. 5). These cells were absent from the tips of the villi because of the ulcerative condition present. The lumina of the glands were empty. Some of the sections showed typical lymphoid follicles.

Thus the microscopic picture corresponded to the mucosa of the intestine with its characteristic columnar epithelial lining of the Lieberkuehn's glands which covered also the projecting villi. Some sections resembled very closely the structure of the appendix (Fig. 3). The loose cellular connective tissue surrounding the glands together with the muscular layer beneath this zone helped to reproduce a fairly characteristic picture of a section of the bowel. It was evident, therefore, that this umbilical polyp belonged to the congenital type of outgrowths that have their anlage in remains of the omphalomesenteric duct.

An interesting histological finding may not be altogether irrelevant at this point. In some of the serial sections studied, there were found tongue-like projections of squamous epithelium growing in from the margins of the skin, which abruptly separated the mucosa from the contiguous tissue (Fig. 3). A study of the leucocytic infiltration revealed a rather striking difference between the elements found in the loose cellular tissue of the mucosa and the denser connective tissue of the corium in the immediate vicinity; in the former, the infiltration between the glands consisted mainly of eosinophiles—a condition

Fig. 1.

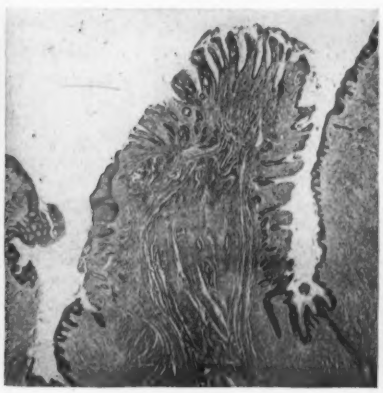


Fig. 2.

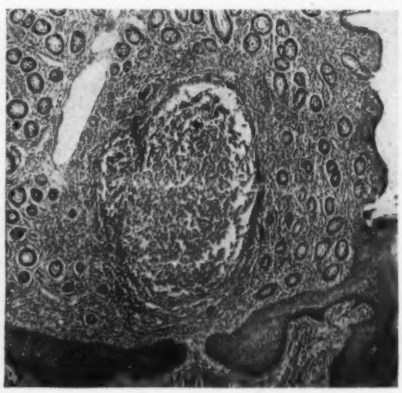


Fig. 3.

Fig. 1. Case 1. Photograph[1] of umbilical polyp cut in two.

Fig. 2. Case 1. Low power photomicrograph of a longitudinal section of the polyp showing the general structure. Note the connective-tissue core and the atypical villous projections. A patch of squamous epithelium attempts to cover a small area of the surface.

[1] Photographs by Henry W. Morris, Department of Pathology.

Fig. 3. Case 1. Higher power photomicrograph of a longitudinal section of the polyp taken from a different level. Note the absence of villi and the presence of very numerous glands of Lieberkuehn. In the center is a lymph nodule. This section resembles the vermiform appendix very closely. At the base are seen tongue-like processes of epithelium which almost completely separate the polyp, at this point, from the underlying structure.

so commonly seen in the intestinal tract—while in the latter, the lymphocytes and polymorphonuclears predominated with practically no eosinophiles present. This tends to show that the type of cellular infiltration resulting from an irritant is determined to a great extent by the character of the tissue acted upon. For, obviously, the submucosa and the adjoining subcutaneous tissue had been acted upon practically by the same kind and intensity of irritant, yet the two types of tissues attracted to themselves different types of cells.

The differentiation between this type of growth, possessing glandular structures, and the simple granulation tissue outgrowths of the umbilicus was first made by Kolazcek (1) in 1875. He describes a tumor of the umbilicus in a male infant 18 months old, which he calls an "entero-teratome." Microscopically, the tumor showed closely situated glands lined by columnar epithelium resembling Lieberkuehn's glands of the intestine. The surface was also lined with columnar epithelium. The center of the tumor was composed of bundles of non-striated muscle fibers. This author is probably the first one to suggest the relation of this type of tumor to a diverticulum of the "ductus vitello-intestinalis." He reasons that the character of the epithelium and the type of glands present cannot be satisfactorily explained in any other way. Just as a fistula from the bladder can originate through the urachus, so, in this instance, the tumor may have had its anlage in a retarded obliteration of the ductus vitello-intestinalis.

A year later, Kuestner (2), apparently overlooking Kolazcek's report, seems to have had great difficulty in explaining the microscopic picture of a small tumorous mass, similar to the above, removed from the umbilicus. He was surprised to find a core of connective tissue covered by a layer of granulation tissue in which were present numerous glands lined with cylindrical epithelium. He considers the structure an adenoma arising during the early fœtal development, either from the omphalomesenteric duct or, most probably, as he supposed, from the allantois. In a later article (3) he cites an additional case of "adenoma" in a series of 10 cases of umbilical tumors. Seven of the cases were simple granulation tissue polypi in infants 2 to 5 weeks old. Both of the cases of "adenomata" were in much older

infants. In reporting the second case, he changed his former view in regard to the origin of these tumor masses. He realized that it is not possible to explain the origin of a single layer of cylindrical epithelium from a structure like the urachus or allantois; however, he fails to make a positive suggestion as to its probable origin.

Kolaczek (4) criticizes Kuestner for calling these tumors adenomata, since they are not glandular new-growths but probably represent prolapses of a retarded normal embryologic retrogression of the ductus vitello-intestinalis. He concedes at the same time that he himself also was wrong in formerly naming them "entero-teratome." In suggesting their origin from remains of the ductus vitello-intestinalis, he established the status of this type of umbilical outgrowths that is universally accepted today.

That a number of these polyps are associated with remains from the allantois or urachus is shown by the large series of cases quoted by Cullen (5) from the literature. The diagnosis of this condition is generally fairly easy, because of the escape of urine from the umbilicus. In a few cases more urine passed by this route than through the urethra. In two cases cited (6, 7) a patent urachus was associated with a patent omphalomesenteric duct.

Meckel (8) was the first to point out that disturbances of the normal involution of the omphalomesenteric duct may lead to the formation of certain diverticula of the intestine which now bear his name. Although he taught this as early as 1812, it was not accepted until much later. In 1847 King (9) reported two cases of umbilical tumors which directly communicated with intestinal diverticula situated from 10 to 20 inches above the ileocæcal valve

Roth (10) discusses in detail the tumor masses in the vicinity of the umbilicus which have a congenital basis. He brings out the fact that the intestine is formed during the early weeks of development—at the time when the embryo separates itself from the underlying tissue. During the fourth week, the original vesicle is united to the umbilical region of the embryo by means of a narrow canal, the omphalomesenteric duct. This duct closes at about the sixth week, forming a fine, firm cord. Several weeks later the intestinal coils recede, and normally the connection between the intestine and the umbilical vesicle disappears. Any disturbance, however, of this normal involutionary process may lead to the formation of the relatively common Meckel's diverticulum, or any of its modifications. Roth classifies the sequelæ to abnormal involution under four main divisions:

1. Ordinary Meckel's diverticula—with free ends.

2. Adherent diverticula. The blind end is joined to the navel by means of a fibrous cord, the obliterated omphalomesenteric duct and blood vessels.

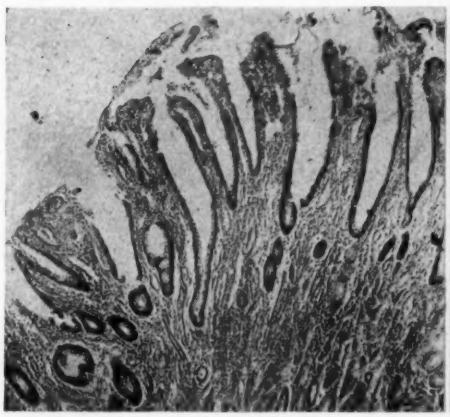
3. Patent diverticula. It is the common form of umbilical fistula. Secondary prolapse may result.

4. Enterocystoma. Retention cysts near the umbilicus which may or may not be connected with the intestine.

The solid pedunculated umbilical polypi are apparently not provided for in this classification; but Hektoen (11) unhesitatingly includes them in Group 3.

Their nomenclature as found in the literature is interesting. Kuestner (2, 3) called them adenomata; Kolaczek (4), enteratomata; Lannelongue and Fremont (19), adenoid diverticular tumors; Holmes (20), "warty or nipple-like tumors." They are also designated as "fleshy" tumors and mucous polypi. Hektoen (11) proposes the name "polypoid vitelline-duct remains." All of these growths present the following features in common: they are small, pedunculated, polypoid masses, having a smooth velvety surface and a reddish color. They secrete a viscid fluid and bleed readily. Microscopically, they show a central mass or core of connective tissue and smooth muscle fibers covered with a layer that almost exactly reproduces the mucosa of the intestine. In practically all cases, regardless of the age of the patient, their existence has been noticed since birth.

It is interesting to note that the first mention in the literature of the existence of patent diverticula associated with fistulæ is



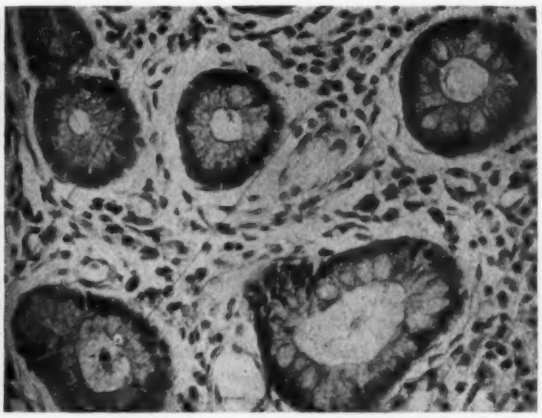


Fig. 4. Case 1. The atypical villi show ulcerations at the tips and small quantities of exudate on the surface. The crypts of Lieberkuehn are well shown.

Fig. 5. Case 1. High power photomicrograph showing a small group of Lieberkuehn's glands cut transversely. The loose cellular stroma shows thin-walled blood vessels and infiltrated leucocytes, many of which are eosinophiles.

not through the primary report of cases possessing demonstrable ducts leading to the intestine, but is rather incidental to the extraordinary observation of seeing living worms escape from the navel. Bottini (12) noticed six round worms, the ascaris lumbricoides, escape through the navel of a 10 year old boy suffering from gastro-enteritis. Nicolich (13) mentions the escape of similar worms from the umbilicus of a woman 25 years old. Bedel (14) reports his observations in the cases of two boys. Siebold (15) cites two cases from the literature and reports a case of his own in which tapeworms—tænia solium—were seen to escape from the umbilicus. His own case was that of a man 22 years old who suffered from a "suppurative umbilicus." Fæcal material was never seen to escape through the opening, and even the worm segments appeared to be clean and free from fæces. In these two cited cases, however, fæcal fistulæ were present. Many cases of this type are found in the literature.

Tillmanns (16) reports a unique finding in a case of umbilical tumor. A mass about the size of a walnut, apparently covered by mucous membrane, was present at the umbilicus of a boy 13 years old. An acid mucoid secretion flowed from the tumor. This secretion was increased by stimulation through handling, so that as much as 2 cubic centimeters could be collected in a quarter of an hour. The fluid was nearly always acid, and contained a ferment which digested fibrin. Tillmanns performed a number of tests with the fluid, the results of which led him to conclude that the secretion, since it contained acid and pepsin-like ferment, must be a product of *gastric* glands. The microscopic examination of the excised tumor showed bundles of smooth muscles and connective tissue in the center, covered by a layer of mucosa and submucosa. Some areas suggested the picture of the pyloric end of the stomach, while other parts were more like the intestinal mucosa. Most of the glands were atrophic. Weigert saw the sections and pronounced the tissue as being most probably related to the stomach wall. The author's explanation, therefore, as to the origin of this tumor is that the navel included a pyloric diverticulum of the stomach in a manner similar to its more frequent inclusion of a Meckel's diverticulum of the small intestine.

Heukelom (17) disagrees with Tillmanns' conclusion regarding the origin of the tumor. Neither the character of the glands nor their secretion, he thinks, can definitely establish their origin. The character of the epithelium often becomes changed in those portions of Meckel's diverticula which become constricted off and separated from the main outpouching.

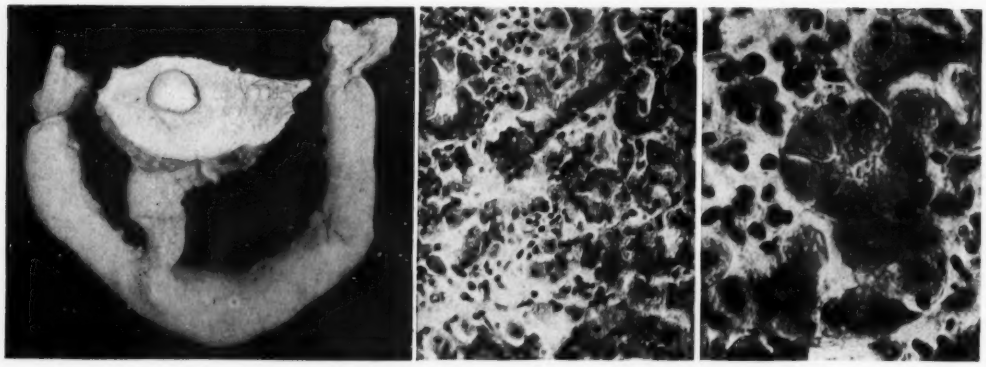


Fig. 6. Fig. 8. Fig. 9.

Fig. 6. Case 2. Photograph of specimen removed at autopsy as an accidental finding.

Fig. 8. Case 2. Photomicrograph of section taken through the distal severed portion of the lumen. Note the large triangular, circular, and irregularly elliptical cells possessing a moderately dense cytoplasm and well-defined deeply-staining nuclei. These cells take a deep eosin stain and are analogous to the "parietal" cells of the fundus of the stomach. Near the lower edge and to the left of the mid-line is a typical gland-like structure, showing these "parietal" cells together with the smaller, more deeply staining "chief" cells. Near the left edge, just below the middle, there is seen one of these acid cells with two nuclei. Many acid or "parietal" cells are seen scattered through the stroma. There is a dense leucocytic infiltration present.

Fig. 9. Case 2. High power photomicrograph of same section as in Fig. 8.

Not infrequently the glands in such constricted portions closely resemble those of the gastric mucosa histologically. He also states that even the acid secretion is no criterion, because the secretion of the intestinal glands prior to the establishment of the biliary flow is acid. He, therefore, believes that an early constricting off (*Abschnuerung*) of the diverticulum results in a glandular structure which has an acid secretion and microscopically resembles the gastric mucosa. A later constriction (*Abschnuerung*), on the other hand, results in the histologic picture of the small intestine with its Lieberkuehn's glands and goblet cells. The secretion in such a case is alkaline.

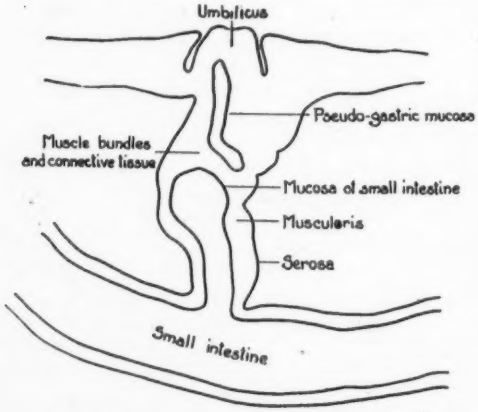


Fig. 7. Diagrammatic sketch of a longitudinal section of specimen from Case 2. It shows the separation of the distal portion of the lumen of the Meckel's diverticulum from the main portion by a connective-tissue septum. The proximal end is continuous with the lumen of the small bowel. The severed portion of the cavity is really a small cyst, communicating neither with the proximal diverticulum nor with the skin surface.

Heukelom's view relative to the origin of diverticula presenting gastric mucosa has been accepted by many authorities (Cullen, 18, and others), and is in accord with the histologic finding in a necropsy specimen which I studied.

This specimen (Fig. 6) was obtained at an autopsy as an accidental finding, in a case of a young man 29 years old, who died from a fractured skull. It showed a narrow Meckel's diverticulum possessing a thick cord-like attachment to the abdominal wall in the region of the navel. The navel itself appeared normal.

On probing the narrow lumen leading from the intestine into the cord, the cavity was found to extend for a distance of about 5 centimeters, where it abruptly ended in a blunt saccular dilatation about 1 centimeter in diameter (Fig. 7). Examination of the apparently solid remaining portion of

the cord revealed a small slightly curved cylindrical cavity measuring about 2.5 centimeters in length and averaging 2 millimeters in diameter. It was separated from the proximal diverticulum by a thin connective-tissue septum. The narrow lumen extended outward to a point just within the knob-like protuberance of the navel but did not open onto the surface (Fig. 7). The umbilical depression was normal.

The microscopic studies of the two cavities proved of unusual interest. Sections of the proximal one communicating with the intestinal canal showed the typical structure characteristic of the small bowel with its muscular layers and its mucosa possessing Lieberkuehn's glands and villi. The glands and villi were covered by a single layer of columnar epithelium containing goblet cells. But the sections of the distal canal revealed an entirely different histology. Instead of the aforementioned intestinal mucosa usually seen in Meckel's diverticula, there was present a picture bearing a very evident resemblance to the gastric mucosa. Throughout the reticular structure were scattered numerous epithelial cells disposed in typical gland-like arrangements, but also present singly, in small groups and cords (Figs. 8 and 9). The striking feature of these epithelial cells was that they comprised two distinct types: one a large cell, rich in cytoplasm, irregularly oval or triangular in shape, possessed a single well-defined nucleus or occasionally two nuclei, stained deeply with eosin, and altogether corresponded to the acid secreting "parietal" cells of the fundus glands of the stomach; the other, a smaller cell, irregular in shape with a single nucleus, took the hæmatoxylin stain and corresponded in general appearance to the chief or peptic cells. The "parietal" cells were situated close to the "basement membrane" of the glands but many were also extraglandular and lay free in the stroma. Many of the cells were 15 to 20 micra in diameter. The free inner surface of the mucosa was ulcerated and the epithelial lining was absent. The coarse stroma between the glands and groups of epithelial cells was infiltrated with lymphocytes, plasma cells, eosinophiles and polymorphonuclear leucocytes. Beneath this, there was a submucosa of loose connective tissue beyond which there was a denser layer of hyaline fibrous connective tissue containing small bundles of non-striated muscle fibers. It was, therefore, obvious that in structure, arrangement, and staining characteristics of the epithelial cells, there was a marked resemblance of this tissue to the mucosa of the fundus of the stomach.

The study of this specimen conclusively demonstrates that umbilical anomalies, presenting a structure which resembles the mucosa of the stomach, need not have their origin in remnants of gastric diverticula or displaced patches of gastric mucosa. Indeed, it is very probable that such relations never exist. In all of the similar cases reported in the literature (Tillmanns, 1887; Van Heukelom, 1888; von Rosthorn, 1889; Reichard, 1898; Wèber, 1898; Lexer, 1899; Stroda, 1903; Minelli, 1905; Denucé, 1908) not one presented convincing evidences that the anomaly had its origin in or was in any way associated with the stomach wall. The conclusions of Tillmanns (16) and others were mere conjectures arrived at from histological appearances only, and naturally proved the easiest explanation. But the specimen here studied, as well as the case reported by Lexer (21), shows very clearly that different portions of the same diverticulum of the intestine may possess totally different histologic appearances, and that a portion completely separated from the intestinal lumen by a septum may present a picture closely simulating the gastric mucosa. Van Heukelom's view, therefore, is completely corroborated by the findings in this case. The distal cavity was severed perhaps from the main diverticulum very early in the development of the ovum, prior to the establishment of the flow of bile and the alkaline secretions. This resulted in a glandular structure which histologically resembles the mucous membrane of the stomach and which functionally probably had produced an acid secretion.

The second case discussed in this paper, although it presents an umbilical anomaly with a structure resembling the gastric mucosa, belongs to the same class of congenital abnormalities as the first case, having developed from the remains of the omphalomesenteric duct.

SUMMARY

1. Umbilical inclusions of remnants of the omphalomesenteric duct are not at all uncommon. Most of the "umbilical granulomata" are probably structures of this type.

2. Umbilical polypi, presenting gastric mucosæ, undoubtedly originate in remnants of the omphalomesenteric duct and not from gastric diverticula. The histological and functional characteristics of these anomalies are probably determined by the stage of

fœtal development at which time the constriction or *Abschnuerung* occurs.

3. The milieu is an important factor in determining the type of cells called forth by any given stimulus.

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GANGRENE OF AN ECTOPIC KIDNEY FROM TWISTED PEDICLE

BY J. LOUIS RANSOHOFF, M.D., F.A.C.S., CINCINNATI

ECTOPIC kidney is in itself not of sufficient rarity to warrant the report of a single case. It is in fact not an uncommon condition. Naunam found 21 cases in 10,177 autopsies. Guizzetti and Pariset reported 18 cases in 20,000 autopsies. Dorland, in 1911, collected 121 clinical cases. This condition is, as a rule, accidentally discovered during an operation undertaken for some other surgical condition.

Ectopic kidney, which is a true congenital anomaly, must be sharply differentiated from movable kidneys of all degrees.

Ectopia of the kidney is an arrest in the ascent of the kidney from the pelvis to the position it occupies in the normal adult life. The reason for this arrest in ascent is one of conjecture, but in all likelihood it is caused by the anomalous origin of the renal artery from the common or external iliac. In the case of sacral ectopia, the arrest occurs during about the seventh week of embryonal life. With the newer methods of renal diagnosis, particularly pyelography, the diagnosis of ectopic kidney is not infrequently made prior to operation, particularly when symptoms point to a disease of the kidney on this side.

In ectopic kidney, the artery is short and comes down from the nearest large trunk, either the aorta or the common iliac. The pelvis and ureter are usually on the anterior surface of the kidney, retaining their embryonal relation. The ureter is short and enters the bladder in the normal position. The ectopic kidney is as a rule fixed in its position, by both its short artery and its complete retroperitoneal location.

CASE. Female, age 12, referred by Dr. A. H. Carr. Nothing in the past or family history is germane to the present condition. For the past three weeks, the child has complained of pain in the lower abdomen which has at times assumed a colic-like character. There has been constipation. The child has eaten and slept well and has attended school. There has been no vomiting and no history of sudden strain or injury. On November 21, the pain became more severe and there was one attack of vomiting. On

November 22, 1919, 4 p.m., the child was admitted to Jewish Hospital.

Examination on admission revealed a well developed and nourished child. The heart and lungs were normal. The temperature was 99.2°, pulse 100. Leucocyte count 9,000. The urine was clear, light amber; specific gravity 1020; no albumin, sugar, casts, or blood. There was a slight rigidity of the lower recti muscles, particularly on the right side and a moderate degree of tenderness. Diagnosis: subsiding subacute appendicitis. Operation, Jewish Hospital, November 24, 1919, gas ether anæsthesia, gridiron incision. On opening the abdomen a moderate amount of blood-stained serum escaped from the pelvis. A pelvic examination revealed a tumor mass in the hollow of the sacrum. The incision was enlarged and the patient placed in the extreme Trendelenburg position. The tumor was delivered into the wound and proved to be a gangrenous ectopic kidney entirely intraperitoneal. The pedicle was twisted from the left to the right three and one half times. Adherent to the anterior surface of the kidney was the right tube, also gangrenous. The ureter came from its normal position and was about 3 inches in length. As near as could be determined the artery arose from the common iliac.

Examination revealed a normal kidney on the left side and an empty pouch in the normal kidney position on the right side. The pedicle was tied and the kidney removed, the tube being cut off close to the uterine horn. No trace of the right ovary could be found. The left ovary was normal. The appendix was moderately inflamed and was removed in the usual manner. Recovery uneventful.

The attachment of the tube can be easily explained by its proximity to the kidney during fœtal life. There are, however, several features of this case which are entirely inexplicable. The complete intraperitoneal position of the kidney with mesentery containing the artery and ureter, is difficult, if not impossible, to explain. In the absence of any fall or sudden strain, the twist may perhaps be explained by a sudden peristaltic movement of the sigmoid, which started the rotation of the kidney. A rather extensive search of the literature has failed to reveal a similar case.

Looking back on this case, it might have been possible to make a diagnosis had a rectal examination been made. The symptoms, however, pointed so clearly to an appendicitis, that further examination seemed unnecessary.

TOXIC GOITER FOLLOWING EPIDEMIC INFLUENZA[1]

By C. A. ROEDER, M.D., Omaha

THE etiology of any type of enlargement of the thyroid is still a mystery and the pathology was a hopeless puzzle until Wilson and Plummer placed it in a more definite clinico-pathological basis. We feel that the nodular or adenomatous and hyperplastic goiters are frequently, if not always, caused by infections from various foci, but not many records are available demonstrating the close relationship between an acute and more general infection and toxic goiter. The past epidemic of influenza left more various complications than any other known infection, and it was our privilege to observe three toxic adenomatous cases and five exophthalmic (hyperplastic) cases of goiter, all developing rapidly and immediately following the infection.

Case 1. Toxic adenoma. Mrs. W., Pisgah, Iowa. Age 38, married, 2 children. The patient has had a nodular goiter since she was 20. The goiter had been barely noticeable and had produced no

[1] Abstract of a paper read before the Association of Residents and Ex-Residents of the Mayo Clinic, October 8, 1919.

symptoms. Two months ago the patient had epidemic influenza without pneumonia, and four weeks after onset she became very weak and had an enlargement of the right side of the thyroid gland. One week later a marked psychosis developed, called by the neurologist toxic psychosis, with pulse 120-140. Removal of this adenomatous mass, which was degenerating and of an intense greenish color, relieved the patient within a few days and she made a steady and complete recovery.

CASE 2. Toxic adenomata. Mrs. J. H. B., Omaha. Age 48. The patient has had a nodular goiter for 19 years, with no symptoms. She had epidemic influenza in November, 1918. This was followed immediately by nervousness, tachycardia, tremor, increasing weakness, very moist skin, and œdema of the face and ankles. She presented an enlarged nodular gland, pulse 140, no eye signs; glycosuria; blood pressure 120-90. Double resection was done and degenerating adenomata removed. She made a rapid recovery.

CASE 3. Toxic adenomata. Mrs. C. Z., Omaha. Age 42. The patient has had a nodular goiter for 20 years, with no symptoms. She had epidemic influenza in November, 1918. Since then there has been no change in the size of the gland but her illness was immediately followed by increasing weakness, tachycardia, nervousness, dyspnœa and moist skin. The blood pressure was 120 and 80; albuminuria; eyes staring but not protruding. Double resection was done and degenerating adenomata removed. She made a rapid and complete recovery.

CASE 4. Hyperthyroidism. Miss W., Petersburg, Nebraska. Age 24. The patient had had epidemic influenza without pneumonia 4 months before consultation. One week after getting up she noticed dyspnœa, nervousness, tachycardia, and increasing weakness. All symptoms for past 3½ months gradually increased and 3 weeks ago she noticed enlarging thyroid for the first time. Pulse 120-140; Graefe sign; moist skin. Double ligation produced only very little improvement. Both inferiors were then ligated. At present she is improving.

CASE 5. Hyperthyroidism. H. C. L., Omaha. Age 37. The patient had had influenza without pneumonia in November, 1918. Three weeks after getting up she noticed increasing nervousness, weakness, and tachycardia with attacks of diarrhœa, at which time she passed blood. A goiter was first noticed about 8 weeks after the onset of the influenza. No exophthalmos was present but there was a moderate Graefe. The skin was stained intensely dark, resembling Addison's disease. Pulse 130-160. Single ligation and resection were done. Pathology—hyperplastic thyroid. Good recovery.

CASE 6. Hyperthyroidism. P. L., Hampton, Nebraska. Age 20, single, female. For 2½ years the patient had had a small nodule in the thyroid which produced no symptoms. She had epidemic influenza in November, 1918. One week after getting up she noticed enlarging of the neck and nervousness, sweating, and palpitation, soon followed with loss of weight. The eyes became more prominent 2 months after onset. Examination showed pulse 140, skin moist, tremor, and moderate exophthalmos. Double resection. Pathology—hyperplastic thyroid. Recovery.

CASE 7. Hyperthyroidism. Mrs. L. C. P., Grenora, S. D. Age 29. A goiter was first noticed immediately after epidemic influenza in November, 1918. Since then the patient has suffered from increasing nervousness, weakness, tachycardia, and loss of weight. There is no exophthalmos but a marked Graefe. Thyroid enlarged (2), uniform. The skin was very moist. Double resection. Pathology—hyperplastic thyroid.

CASE 8. Hyperthyroidism. Mrs. D. A., Omaha. Age 32. The patient had an attack of epidemic influenza in November, 1918, which was followed immediately by nervousness, dyspnœa, headaches, tachycardia. The symptoms gradually increased and the patient had spells of vomiting and diarrhœa. The thyroid was moderately enlarged and marked thrills, bruit, and a Graefe were present. There was no exophthalmos; pulse 130, skin moist; extreme hunger; glycosuria. Double resection. Pathology—hyperplastic thyroid. Good recovery.

Out of these 8 cases 3 had adenomata which suddenly became very toxic. The 5 cases of hyperthyroidism had their onset definitely following influenza. The toxæmia from the 3 cases of adenomata may have been present before the epidemic but it was very slight, as the blood pressures were all low and no other changes were evident. Since this paper was written I have had five more cases, three hyperplastic (exophthalmic) and two toxic adenomata all coming on following epidemic influenza.

DIVERTICULUM OF THE DESCENDING COLON CAUSING HYDRONEPHROSIS

By GEORGE F. STRAUB, M.D., Honolulu, Hawaii

CASES of diverticulum of the colon, and of its descending part in particular, are so rare as to merit the publication in detail of each individual case.

Mrs. C. D. R., age 51 years, married in 1896, was admitted to Queen's Hospital June 25, 1918. The patient had never been ill before her marriage. The menses which had always been regular in quantity and quality, stopped in 1917. The climacterium passed without any disturbance. She had no children. No pathological discharge had been noticed at any time. A number of times she had the os dilated for sterility with no effect. She had never been pregnant. Bowel movements and urination were normal with the exceptions referred to below.

About 6 months after marriage the patient began to ail with, what she thought to be, "malarial" symptoms. She had a normal temperature in the morning, a rise to 102° and more in the evening, followed by very profuse sweats. She does not remember whether or not she had chills. There was only a slight feeling of fullness at times in the left flank, but no other local symptoms of any kind. These symptoms came on in the form of frequent attacks lasting a week or so and, in the beginning, did not cause much weakness or discomfort aside from forcing the patient to bed in the afternoon. In March, 1897, an exploratory operation was advised by the then attending physician, although there was no pain on pressure in the abdomen, no tumor palpable, vaginal examination was negative, but the patient became more and more exhausted through these repeated attacks of fever and discomfort in her left side. One morning, a few days before the operation, she was surprised by the free passage of a great deal of urine containing a large quantity of a gangrenous-looking and smelling fluid. The bladder was washed frequently, and on March 13, she was operated upon by laparotomy, the operation lasting 2½ hours. All she was told was that a great amount of pus, had been found and that no organs were removed. The incision healed only partly, and a large quantity of pus and, at times, urine came through the wound. Since that time tenderness developed in the left flank radiating toward the back under the ribs. During her slow reconvalescence she decided to go to San Francisco, and on July 5, while on board of ship, she took a Seidlitz-powder, which caused a great quantity of gas, together with some fæces, to escape through the wound. Another "long operation was done, adhesions broken, nothing removed, the source of the trouble not located and the abdominal cavity drained through the vagina." There were frequent irrigations. The urine at that time and for a long time after contained considerable heavy slimy matter. In December there was only a small opening left of the incision, still secreting, and requiring much dressing. The incision healed and opened alternately until October 1899, when, after a hard chill and temperature, a quantity of pus was discharged and in a short time the incision closed never to open again. After this the patient developed peculiar attacks, which came and went every few weeks. She had occasional high fever and acute pain, in fact was never free from discomfort in the left upper abdomen and loin, the acute attacks being generally relieved *by either a flood of urine or by passage of considerable gas and stool by rectum.*

Examination. The chest was negative. The abdomen was negative except for a palpable mass around and below the left lower kidney-pole, 4 inches laterally from the umbilicus, immovable on palpation and changing on percussion after inflation of the colon, painful on pressure. Vaginal examination was negative. Leucocyte count: 11,800, 82 per cent polymorphonuclears. The urine was absolutely negative on repeated examination. An X-ray examination of the stomach made in the course of an examination by another physician in February, 1917, showed a normal stomach-series, a small diverticular projection above the colosigmoidal junction, a cæcum of the fœtal type and a residue in the appendix after 4 days.

Cystoscopy. June 26, 1918. The bladder was found to be normal except for a slight transposition of the trigone toward the left, the left ureter apparently being pulled upon in an upward direction. The ureteral orifices were normal. Spurt normal. Ureteral catheters on both sides could be passed up to the kidneys without difficulty. Indigocarmine and phenolsulphonephthalein tests showed 1 minute's delay on the left side — 5 and 6 minutes respectively — were otherwise normal in quality and quantity except for a slight diminution on the left side — 9 and 7 per cent respectively. The capacity of the left kidney pelvis was 52 cubic centimeters, that of the right normal. Bacteriological examination of the urine was negative.

X-ray examination of urinary tract. A plain X-ray of the kidneys was negative. In the region of the left ureter below the sacro-iliac joint, there was a small shadow, possibly a concrement, although the catheter did not meet with obstruction; but a subsequent X-ray, June 28, did not show this shadow any more.

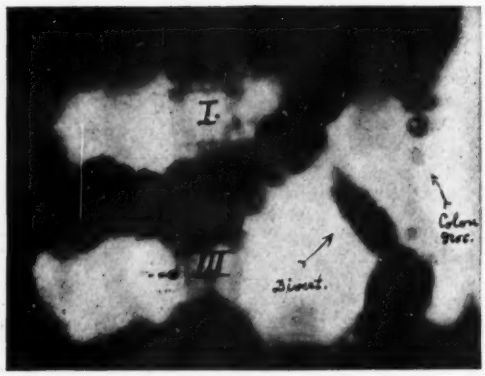

Fig. 1. Colon after bismuth meal. The diverticulum is demonstrated pointing toward the first lumbar vertebra.

Fig. 2. Roentgenogram taken after bismuth enema with the diverticulum filled to capacity. Pyelogram made simultaneously shows relation of ureter and kidney pelvis to the diverticulum. I, II, III, lumbar vertebræ.

Pyelogram. The right side was normal. The left kidney-pelvis showed moderate enlargement and indistinct outline in its lower pole. Another pyelogram taken on July 2, of the left side only in combination with a bismuth-enema showed the kidney the same as on June 26 (Fig. 2). The descending colon presented a diverticulum pointing toward the right side, upward and ending in the region of the lower pole and pelvis of the left kidney. After 24 hours a residue was left in the diverticulum in the same position, but much less intense than on the day before.

X-ray examination of the colon. June 30. This picture, taken after a bismuth meal, had already shown the same diverticulum, but not as plain as the enema (Fig. 1).

Diagnosis. Diverticulum of the colon descendens causing intermittent hydronephrosis of the left kidney.

Operation, September 14, 1918. Dr. Judd assisting. A left pararectal incision, 4 inches long, was made over the descending colon. Before opening the peritoneum a hazelnut-size area of thick pus was encountered — evidently the trace of an old threatening perforation — behind which the colon descendens was adherent to the peritoneum. On the posterolateral side of the colon the diverticulum was dissected out of dense adhesions. Its base was about 2 inches in diameter. In its course it ran behind the colon pointing upward and toward the median line, in a general direction toward the lower pole of the left kidney, for about 2½ inches, retroperitoneally. The tip of the diverticulum had perforated and was continuous with a retroperitoneal fistulous tract another 2½ inches long and 1 inch wide ending near the left kidney pelvis and around the left ureter. The diverticulum was trimmed off, inverted by two catgut and one linen suture, and this suture line covered with a fat flap available. The sinus was enlarged, curetted, the peritoneum closed, and an extraperitoneal 10 inch long rubber drain left in place, running from the front incision out through a counterstab near the lower kidney-pole. The rest of the incision was closed in layers.

The patient made an uneventful recovery and is now in excellent health.

Aside from the diagnostic interest, which this case offers, it is mainly the history and pathology, which compels the attention of the medical mind. In reviewing the history from its very beginning, 22 years ago, it is possible to distinguish three distinct stages of the process. First we see the patient pass through a rather uncharacteristic and vague period of chronic diverticulitis, which may be explained by the fact that the diverticulum had a retroperitoneal location. This stage ended by perforation of its apex into the surrounding tissues, and the formation of one or more abscesses gravitating toward the pelvis with resulting fistulæ and perforation into the urinary tract. The still persisting diverticulum and its fistulous extension as shown at the time of the last operation finally led to the third and most interesting period: the one of the intermittent hydronephrosis. There is no doubt in my mind that the whole symptomatology of this case was caused by this one condition in its various stages and forms. And from the operative findings it is also absolutely evident that the diverticulum in question was a true congenital diverticulum, perhaps of the ancestral variety, if we wish to follow Cahier's classification.

NARCOSIS TREMOR AND ITS TREATMENT

By Dr. TORSTEN RIETZ, Västervik, Sweden

THERE is not a word to be found, either in the better textbooks on surgery or in special works on general anæsthesia, concerning the tremor which sometimes appears during narcosis. As it is an exceedingly disturbing complication and hinders the surgeon while operating, and moreover as I believe I have found a method by which it can be overcome, I will give a short account of my experience in the hope that my method may help others.

Narcosis trembling resembles very much a series of frequent rhythmic muscular contractions. These are sometimes so violent that they are almost mistaken for clonic cramp. The trembling attacks chiefly the lower extremities, but sometimes the trunk is also involved, at least the lower part. The frequency and severity of the spasm remind one most of the findings in cases of intense tremor, of epileptic attacks, or spasms from other cortical irritation.[1] Usually the trembling comes on suddenly, without warning, and as a rule immediately reaches its full intensity; then, after a longer or shorter period it disappears as suddenly as it appeared. There are no single detached spasms later, such as one sees in eclampsia or epilepsy. The phenomenon always appears as a series of rapid spasms at regular intervals. The severity, however, varies in different cases as well as in the same patient during a given narcosis; it may happen that at first the trembling is very slight but that later, attacks become more violent. Sometimes the trembling appears only as slight, rapid, spasmodic jerks lasting for a fraction of a minute. In some cases the trembling continues as long as 5 minutes and in some cases even longer, and this, it is readily seen, is a great hindrance to the surgeon in performing the operation. In several cases we were able to check the trembling by means of the technique which is described below.

[1] Among the many forms of tremor which have been described, are also the groups, cerebral tremor and the so-called cerebral form of toxic tremor.

Before outlining my method, however, I wish to sum up briefly the results of my investigation regarding narcosis trembling or tremor.

Thirty-three cases in all have been observed during the years 1912 to 1919. With two exceptions only, the patients were men, that is there were 31 males and 2 females. Most of the patients were between the ages of 25 and 40, but this group is, in any case, the one most frequently found among our hospital patients. Attaching due importance to this circumstance, we find that the cases are pretty evenly distributed over the ages 16 to 68 years. A predisposition for a certain age does not, therefore, exist, but on the other hand narcosis tremor has not been observed in children under 16.

Neither the hospital records nor the objective examination of the patient has afforded any exact means of determining the factors which may possibly be considered as favoring the appearance of the above described spasms. The patients did not show more than other patients extreme agitation and there was not present confusion or excitement at the time the patient was given the anæsthetic. Then, too, in several cases the narcosis tremor did not appear until toward the end of the operation or even until the patient was returning to consciousness. As to the time of appearance there is no regular time as is shown in the following summary:

	Cases
Spasms observed at the beginning of narcosis	3
Spasms observed at the beginning and middle of narcosis	2
Spasms observed at the middle of the narcosis	1
Spasms observed at the middle and end of the narcosis	1
Spasms observed at the end of the narcosis	6
Spasms observed during whole narcosis	1

The technique used in administering the anæsthetic does not seem to make any difference nor does the position of the head, etc. In 28 cases ether was given, in 2 a mixture of chloroform and ether (as regards 3 patients there is no note "narcosis with ether" but

there is reason to believe that such was given, which would give 31 and 2 mixed anæsthesias). The quantity of ether or chloroform used does not assist in determining the cause of the spasm nor does the duration of the narcosis The largest quantity of anæsthesia used was 250 cubic centimeters of ether and the longest period was 2 hours. These figures are, however, exceptional and the average quantity and time would be about 120 cubic centimeters in 35 minutes. It has often happened that several operations have been performed, one after the other and that also other patients have been anæsthetized out of the same bottle as the tremor cases and the other patients have not exhibited narcosis spasm. The ether is kept and tested in such a way that there is no reason to assume adulteration or decomposition of the anæsthetic.

As was to be expected, the part of the body on which the operation was performed was irrelevant to the appearance of the tremor; thus the spasms cannot possibly be regarded as a sort of so-called reflex-epilepsy originating in a definite part of the body. On one occasion in an operation for varicose veins, it was observed that the spasms chiefly affected the leg on which the operation was being performed. This circumstance, however, does not seem to be of any significance and can be partially explained by the fact that the other leg was kept in a fixed position.

Because of the character and course of the attacks in our series, we feel justified in comparing them with the rhythmic contractions which occur in a number of other conditions and which are considered to depend on an abnormal irritation, influencing in some manner the motory courses. It is true that this is generally believed to occur in the cortex of the brain, but as to the nature of this disturbance, we know very little. It is outside the scope of this paper to discuss the various theories regarding this question.

The narcosis tremor must be due to an irritation which is produced in some manner by the narcotic which is conducted to the brain through the circulation of blood.

What then is the reason that such spasms do not always occur, but appear only in a few cases?

As shown above, the type of case and the mode of administering the anæsthetic do not throw any light on the subject, except to show that a marked predisposition exists in men. We are, therefore, forced to assume that the abnormal irritation which produces these motory symptoms has some connection with a special sensitiveness in these patients. This assumption is strengthened by the fact that in certain individuals and certain conditions there is a predisposition to epileptic attacks. This varying sensitiveness renders it impossible ever to know with certainty whether epilepsy will appear or not, for instance after a depression fracture of the skull, etc.

On the hypothesis that narcosis tremor is the result of an abnormal irritation of the brain produced by the anæsthetic which is conducted thither by the blood, I have endeavored to overcome this phenomenon. To eliminate, at least for a moment, the influence of the irritated motor centers, during an operation on a boy of 16, I pressed, for a few seconds, on the neck in the fossa carotica. The result was evident at once; the narcosis tremor disappeared as by magic. It appeared again, however, when the pressure was removed. Renewed experiments had precisely the same effect. When pressure was again applied for a somewhat longer period (about one quarter minute), the spasms ceased definitely.

Although on some occasions the manœuvre had doubtful results or none at all, continued observations still showed that the measure was of value. As regards the effect of pressure, the cases may be divided into three groups. The first includes those patients in whom compression gave a positive result. By this I mean that the spasms immediately decreased in force, or ceased altogether after the application, by means of a regular grip, of pressure on the designated spot. Generally speaking, in these cases, the reaction on the part of the patient, in the form of a weakening or cessation of the disturbing spasms, is so prompt that one is left in no doubt whatever as to the effectiveness of the measure. If the pressure is applied for only a short time, the tremor usually returns; a somewhat longer application of pressure on the other hand stops the tremor definitely.

If, from the beginning, only a slight pressure is exerted, there is merely a diminution of the trembling. If the pressure is decreased still more the spasms at once become more violent, so that the pressure can be regulated by the intensity of the jerks. I remember only one case, that of a man of 55, in whom there was a distinct gradation from less severe to complete cessation of the spasms. Another peculiarity was also observed in this case; the tremor which, in the beginning of the narcosis, was less pronounced was at this time but slightly affected by pressure and showed a diminution only in the extent of the phenomenon. The trembling gradually increased in intensity, but could now be stopped by means of pressure. Cessation of the trembling, however, lasted only as long as the pressure was maintained. It was noticed that the quadriceps femoris and the muscles of the calf were considerably contracted during the period of cessation of the spasm.

The other group includes cases in which the results were not decidedly positive, and the narcosis spasms possibly ceased of themselves, or circumstances rendered the investigation incomplete.

Finally come the cases in which compression was ineffective. In the 33 cases mentioned the measure was used 29 times; 4 patients had short spasms which ceased of themselves and did not call for treatment.

The other 29 cases fall into 3 groups as follows: In Group I, the effect was certain in 19 cases; in Group II, the effect was uncertain in 5 cases; in Group III the effect was nil in 5 cases.

In no way does the result vary in so far as the degree of unconsciousness is concerned nor does the result bear any relation to the duration of the narcosis (only once has a suggestion of this been evident; compare the above-cited observation in the case of the man age 55).

The technique used in exerting the pressure is extremely simple, but experience has taught me that the method may fail if it is not applied precisely as it should be; therefore, it may not be superfluous to mention briefly a few details. In the position in which the narcosis nurse generally sits it is perhaps difficult for her to apply a sufficiently powerful downward pressure in the carotid fossa. It is easier to apply pressure in this region if one stands at one side of the patient and turns his head over toward the other side. The pressure is applied either with the thumb or the four fingers together.

There is still a question, however, as to whether compression of the blood vessel is the principal requisite. Can not a similar powerful and painful pressure on other parts of the body, at least during superficial narcosis, produce an *ablenkung* and by reflex action bring about a cessation of the spasms? In order to ascertain if this is so, I have pressed hard, for instance, on the nerves of the axilla and have sought, by other means which affect the centripetal nerves and produce pain, to obtain the same result as by the method described. All such experiments have given absolutely negative results.

It remains only to say a few words as to why my method did not produce the desired result in some cases. The material studied does not throw any light on the subject; unless perhaps it may sometimes be desirable to exert pressure on both sides. As is well known, the carotid arteries vary somewhat in size in different individuals, both in relation to each other and to the basilar artery. This is also the case with the arteria communicantes which enter the circulus arteriosus Willisi. If, therefore, the arrangement of the vessels going to the brain is such that the supply of blood takes place chiefly via the cerebral arteries it can easily be imagined that compression of the carotid fossa in the neck does not exercise any special influence.

In conclusion it may be said that the method has produced no inconvenience nor untoward end-results. If the necessary instructions are given to the person who administers the anæsthetic so that if narcosis tremor appears she will know what to do, there is every probability that this troublesome complication can be avoided and the operation can be completed in peace and quiet.

THE UNRELIABILITY OF TEMPERATURE IN THE OTITIS OF INFANTS AND CHILDREN AS AN INDICATION FOR THE MASTOID OPERATION [1]

By FRED WHITING, M.D., F.A.C.S., New York

AMONG the many vexatious and confusing problems which confront the otologist in his daily experience, few present themselves which offer greater difficulties in their solution than those cases of otitis in young children which, although attended by alarmingly high temperatures, are unaccompanied by convincing physical signs of mastoid inflammation.

It is intended that the scope of this discussion shall be limited in its application to a consideration of inflammatory ear conditions such as manifest themselves in infants and children still too young to participate by their intelligent co-operation in relieving the perplexities of the otologist.

There are so many pathological conditions, some serious, some quite unimportant, which may supervene upon an attack of otitis that any attempt at a comprehensive enumeration of them would prove not only burdensome but unprofitable as well.

Certain of these diseases, however, are encountered as such frequent concomitants of ear inflammations in children that they are entitled to preferential consideration as probable causative agents in the production of temperature whenever a situation arises in which the diagnosis cannot be clearly established.

In considering a few of the diseases which commonly complicate otitic inflammations in infants, we may enumerate bronchopneumonia, lobar pneumonia, especially of the central type, grippe, influenza, gastro-intestinal disturbances, pyelitis, malaria, and the exanthemata.

To this list might be appended a further imposing array of maladies; but those already mentioned are sufficient in number and variety to test the diagnostic acumen of the most experienced physician in the effort to differentiate, in the absence of physical signs, between a group of symptoms which for example may precede a bronchopneumonia and a closely analogous group which is the precursor of meningitis or pyæmia.

So sophisticated have the laity become in recent years in regard to inflammatory ear disease and the serious nature of the complications which emanate therefrom that the relatives and friends of patients not infrequently constitute themselves a board of censors whose insistent demands for an immediate diagnosis are at times sufficiently harrassing to disconcert sorely the attending physician.

Never was the truth of the trite saying, "a little learning is a dangerous thing," more in evidence than at the present moment, the inconsistency of the layman being well illustrated by the following proposition: given a sick baby presenting an array of symptoms including temperature, nausea, vomiting and the like but without inflammation of the ears, and the relatives will contemplate the situation with a reasonable degree of composure if not entire equanimity. Corollary: Given the same baby with the same symptoms, plus suppuration of the ear and the family immediately becomes apprehensive of some dire impending calamity and can with difficulty be induced to take a rational view of the situation; in which attitude they are supported by the manifest concern displayed by an overzealous or timid pediatrist.

What wonder then that the exercise of well-balanced and conservative judgment by the otologist becomes at times nearly if not quite impossible. In view of which experiences there is no occasion for surprise that normal mastoids are sometimes operated upon but rather there is reason for congratulation that such regrettable incidents are not more frequent.

I will briefly enumerate the essential features of but three cases as illustrative of the perplexities which so often confront us.

[1] Presented before the Clinical Congress of American College of Surgeons, October 21, 1919.

CASE 1. An infant one and one half years of age, the child of a physician. When first seen both ear-drums were red and bulging; the child was tossing restlessly about and his temperature was 105°F. A double myringotomy was performed without anæsthesia and a moderate quantity of serosanguinolent fluid evacuated from each tympanum. A culture made from the fluid adhering to the knife blade subsequently developed a pure pneumococcus as the infecting organism. The child's temperature immediately dropped to 100°F. and his restlessness diminished somewhat; but his nurse reported that he had been fretful during the night.

When seen at 3 p.m. on the following day, each tympanic membrane presented an opening amply sufficient for drainage. There was an entire absence of swelling or bulging. The discharge could properly be described as moderate in amount and mucopurulent in character. The temperature was 105°F. and a blood count made at this time showed total white cells 16,000 with 70 per cent polymorphonuclears.

During the four succeeding days of the child's illness there was no material change in the symptoms above enumerated. He did not cough and his respirations, although somewhat accelerated, were not rapid. Nothing resembling a chill was observed and two blood cultures were reported as negative. The ears continued to discharge a moderate quantity of mucopus but physical examination revealed no changes at the fundus which could be regarded as furnishing convincing evidence of any mastoid inflammation. The integument over the mastoid processes was normal in appearance.

The child appeared to be very ill and each afternoon found the inexorable thermometer indicating 105°F. while the morning temperature ranged somewhere about 101°F. presenting a characteristic septic wave.

The patient's father was a physician and when to that statement is added the further illuminating information that he was a pronounced neurasthenic, I am sure that the enviable situation of the attending otologist will appeal with a keen sense of appreciation to some of my hearers who have doubtless enjoyed the felicity of a similar tranquilizing experience.

A glittering galaxy of medical consultants was in daily attendance and every organ of the child's economy including some which were as yet rudimentary, was subjected to the most critical scrutiny with the gratifying result that the anxious parents received a volume of reassuring information as to the number of diseases which the child did not have coupled with the unanimous opinion that the ear condition was the responsible agent in the premises.

I had repeatedly suggested that in view of the nature of the infecting organism, a central pneumonia, the physical signs of which were delayed, might be responsible for the phenomena presented in this case and had maintained with faint hearted support of an otological colleague that the ear symptoms were in no wise convincing of mastoid involvement. So insistent, however, was the attitude of the combined medical advisory board against me that I should have been compelled to operate upon both of the child's mastoids had not a central pneumonia obligingly manifested itself at this juncture and relieved the difficulties of the situation.

The child speedily recovered and the ears became normal within a brief period.

CASE 2. An infant one year of age under the care of a colleague who had performed a double myringotomy within a few hours of the febrile onset. The condition of the patient was entirely satisfactory for several days. The amount of discharge moderate and the temperature never above 101°F. Infecting organism: streptococcus hæmolyticus. Ten days after the beginning of the otitis the child suddenly developed a high temperature without any discoverable cause and for one week exhibited wide daily fluctuations between 100° and 105° or even higher.

The usual program was instituted and the child's various functions investigated by skillful consultants who were unable to locate any inflammatory focus other than the otitis and who therefore by process of elimination arrived at the conclusion that they were dealing with a serious complication of ear disease.

Two distinguished otological colleagues who were called in consultation took diametrically opposite views of the situation. One insisted that a double mastoid operation should be performed at once, while the other advised that there should be no operative interference.

Further consultation having been requested I was asked to see the patient and upon examining the ears found a scanty seromucoid discharge escaping from an ample opening in the inferior posterior quadrant of each membrana tympani. There was no bulging or sagging of the meatus nor was there any fullness which would indicate the presence of retained discharges. The picture was such a one as we often see in cases of otitis which are undergoing satisfactory resolution.

The integument over the mastoid area was normal in appearance and pressure in this region elicited no evidence of pain or soreness. I could see no indication for operation other than that of high temperature unsupported by the physical signs of mastoiditis. I advised, therefore, that a blood culture be taken and that the patient be kept under observation pending further developments. This suggestion was adopted and within a few hours the child's temperature became normal and was never again a source of concern.

Four days later the ears were completely healed and the patient discharged from treatment.

CASE 3. A girl of 3 years, under the care of a colleague who had performed a myringotomy upon the right drum within a few hours of the febrile onset. For several days the child's condition appeared quite satisfactory, the temperature not rising

above 102°F. and the case was regarded as progressing favorably. The infecting organism was reported to be streptococcus mucosus.

On the fifth day of the inflammation the child had an attack of vomiting with a rapid rise of temperature 104.5°F. The attending otologist was hastily summoned by the parents whose natural solicitude regarding her condition was greatly aggravated by the knowledge that a near relative of theirs had recently died of otitic meningitis.

The examination of the ears failed to disclose any change in the local inflammatory condition which might properly account for the systemic disturbance and castor oil was administered in the belief that a gastro-intestinal attack was responsible for the sudden indisposition.

A blood count taken the same evening provided no information of diagnostic value, showing 12,000 white cells and 72 per cent polymorphonuclears. Notwithstanding effective action of the oil the child's condition remained unchanged. The daily temperature wave recording variations from 101° to 104°F.

The little patient complained of feeling sick (meaning nauseated) but there was no apparent abdominal distention or tenderness. Repeated consultations failed to determine the cause of the temperature or to control the increasing parental anxiety.

I saw the case at the request of the attending otologist and could find nothing in the condition of the ears to warrant mastoid operation. The mother of the child, however, became hysterical over the protracted uncertainty of the case, and the attending surgeon finding his conservative attitude no longer tenable reluctantly consented to operate. He subsequently reported to me in response to my inquiry as to what he had found that he had opened a normal mastoid process.

Forty-eight hours later the cause of the temperature was revealed in a large quantity of pus in the urine, an analysis of which made a few days before had been reported negative.

The child's recovery from pyelitis followed the usual slow course of the disease attended by the discomforts of a needless mastoid operation.

The above enumerated cases are, I am persuaded, in no wise unique, but on the contrary are common to the experience of every busy practitioner.

What attitude then can we reasonably adopt toward such cases which, while safeguarding them from unwarranted and premature operative, measures will not at the same time expose them to the dangers of intracranial inflammation as a consequence of overcautious and dilatory conservatism. Our profession has been accused, and not without reason, of maintaining an unfaltering devotion to medical tradition and of clinging with fanatical loyalty to certain antiquated and discredited standards rather than endeavoring by intelligent investigation to demonstrate the fallacy of such pretensions.

A good illustration of this misapplied fidelity is furnished in a statement which a practitioner made to me the other day, namely that mastoiditis in infants and children is unaccompanied by any recognizable physical signs in the meatus until periosteal swelling can be observed behind the ear. I recall having heard the same statement made when I was a house surgeon. It was no more correct then than now although perhaps more excusable.

Many practitioners who are skillful observers of physical signs in the adult ear are painfully deficient when required to interpret similar appearances in the infant meatus, especially if, as is often the case, the canal is narrow and fairly deep.

To familiarize oneself with the normal structural relations of the infant ear sufficiently to appreciate at their proper valuation the earliest significant inflammatory changes in this organ requires such continuous opportunities for observation as are seldom procurable outside of a children's service in the hospital. And even with the experience derived from such exceptional opportunities the most astute diagnostician may find himself at times baffled by the difficulties presented in examining a very small meatus.

I am convinced that more careful study and observation of the fundus changes in children will enable us to appreciate early signs of mastoid involvement which, with our present superficial diagnostic methods, we frequently overlook.

For example, I have never seen a case of mastoiditis in an infant which did not upon critical inspection show recognizable œdema of the superoposterior segment of the membranous portion of the meatus with some infiltration and bogginess of the structures about the annulus. I think it safe to wait notwithstanding temperatures until such signs appear before operating.

The dangers of delay in operating when demonstrable mastoiditis is present we all appreciate; but is there any justification for

the haste in operating which some colleagues display in their anxiety to anticipate possible serious results?

What untoward consequences may eventuate in a case of acute suppurative otitis in which temperature is the only distinctive factor present if we elect to defer operation until convincing signs of mastoiditis are recognizable.

There is a possibility that serious and sometimes fatal intracranial complications may arise in a small percentage of cases in which no evidence of mastoid inflammation appears at any time, as, for example, primary jugular bulb thrombosis, but such cases are extremely rare and should not be permitted to unbalance our judgment. What anatomical factors are likely to militate against such disastrous consequences? The structural conformation of the infantile type of mastoid is such that the squamomastoid fissure is closed only by fibrous tissue or by an incompletely ossified cementum neither of which tissues offer more than slight resistance to a destructive osteitis; hence the inflammatory products are prone to dissect their way toward the surface, their presence being announced by the altered appearance of the integument over the mastoid process which as a result of periosteitis becomes œdematous, swollen, and red. Is there not as great a likelihood that the osseous structures which interpose a barrier between the antrum cavity and the dura will simultaneously fall a prey to the same destructive osteitis and open an avenue for direct attack upon the meninges and encephalon?

There is unquestionably danger of such a contingency and we not infrequently find destruction of the inner table of the skull with epidural abscess as a concomitant of perforation of the outer table and subperiosteal abscess. None the less the bony structures which lie between the antrum and the dura usually possess a greater density than the more porous and vascular bone tissue which separates the antrum from the periosteum and as a consequence yield less readily to the erosive action of pus. For this reason subperiosteal abscess is a more frequent accompaniment of mastoid inflammation than epidural abscess in my clinic, at the New York Eye and Ear Infirmary in the proportion of 2 to 1.

Is the epidural abscess of infancy commonly associated with a subdural complication; namely sinus thrombosis, cerebral abscess or leptomeningitis? In my experience, no! The outer surface of the dura only is attacked and upon it a protective layer of exudate is disposed accompanied by a further defensive bulwark of granulations, which combined protection constitutes an effectual barrier against subdural infection.

To what extent are these views endorsed by experience drawn from the hospital and clinic? To the extent that large numbers of infants and young children are brought to the clinic suffering from acute otitis accompanied by periosteitis or subperiosteal abscess. These children, so-called neglected cases, have received only such treatment as is comprehended under the term "home remedies" which signifies from the standpoint of the otologist no treatment at all. They represent pure and unadulterated examples of *vis medicatrix naturæ*.

The vast majority of such neglected cases recover after operation, promptly and uneventfully; they have passed without undue excitement or concern through the same gamut of inflammatory manifestations which caused such alarm in the households of the three cases just enumerated and which are merely types of numerous others which we can all of us recall.

Had these neglected clinic cases been under proper medical supervision they would have been operated upon earlier in the course of the disease and hence would not have been exposed to the needless risks of intracranial complications which were present for some days before the swelling in the mastoid region appeared.

What assistance in diagnosis can the laboratory afford in this perplexing class of cases? Only a very limited assistance. The blood count even when frequently repeated for purposes of comparison does not in itself constitute an indication for operation; it supplies at most only corroborative testimony today which tomorrow's finding may invalidate or contradict.

The roentgenogram upon the reading of which we have so justly learned to depend in interpreting structural changes in the adult mastoid bone, cannot be relied upon for positive diagnostic assistance in infants, for the reason that a normal plate of the infantile type of bone is cloudy and inasmuch as little children can with difficulty be kept sufficiently quiet to ensure a proper exposure even when they are anæsthetized. The plates produced are for the most part disappointing and unreliable.

The proposition which I wish to establish is that there is a period preceding the evidences of periosteitis when intelligent and critical scrutiny can detect in the meatus convincing evidence of mastoid inflammation and that this period is the time of election for operating.

I trust that I have made clear my attitude in regard to the conservative position which I think the profession should adopt toward mastoid operations upon children suffering with suppurative otitis whose only manifest symptom of mastoid involvement is temperature.

I certainly do not wish to be understood as advocating that the mastoid operation should be delayed until periosteal swelling is evident behind the ear. I am, however, firm in my conviction that between the period of onset of the otitis and the stage of periosteal swelling, there will appear in the meatus reliable signs of beginning mastoid inflammation which careful scrutiny will reveal, and that the appearance of these physical signs indicates the most favorable time and condition for operation. And furthermore, it is my belief that the welfare of the patient will not be prejudiced by deferring operative procedures until such changes in the meatus manifest themselves.

THE WASSERMANN REACTION AND MISCARRIAGES

By HERMAN GOODMAN, B.S., M.D., New York

IN 1917, through the courtesy of the late Professor E. Cragin, and Dr. R. Ottenberg of the College of Physicians and Surgeons, the opportunity was given us of studying the records of the Sloane Maternity Hospital, with the view of determining the relation between the Wassermann reaction as indicating syphilitic infection, and the number of miscarriages a patient has had.

This study was made from the records of 1,320 women, who had applied to the Sloane Hospital for examination and appointment. It is the policy of the hospital to have blood taken for a Wassermann examination in each instance. The laboratory work is under the direction of Dr. Ottenberg. If any doubt exists as to the character of report, another sample is called for. The history is taken by the examining obstetrician, and includes a statement of the number of interrupted pregnancies the expectant mother has had.

We chose the more conclusive Wassermann negative and four plus positive cases for further analysis. The cases having indeterminate serology were not used because they were too few.

Of the 1,159 Wassermann negative cases, 542 were primiparæ. Of the 637 who had been pregnant previously, 237, or 37 per cent, had suffered a miscarriage. We amplify this in Table II.

TABLE I.—BLOOD WASSERMANN TEST ON 1,320 PREGNANT WOMEN

Result	Number of Cases	Percentage
Negative	1,159	87.
Doubtful	12	0.9
1+	14	1.
2+	17	1.2
3+	29	2.
4+	89	6.7

TABLE II.—NEGATIVE WASSERMANN REACTION

Gravida	Number of Cases	Miscarriages	
		Number	Percentage
II	338	91	27
III	132	51	38
IV	70	31	43
V	35	20	57
VI	20	11	55

The next figures are given to demonstrate another phase of the study.

Of 637 multiparæ with negative Wassermann reactions, 161, or 25 per cent, had had one miscarriage; 41, or 6 per cent, had had two miscarriages; and 22, or 3 per cent, had had three miscarriages.

Of the 89 Wassermann 4+ positive cases, 30 were primiparæ. Of the 59 who had been pregnant previously, 30, or 52 per cent, had suffered a miscarriage, as compared to 37 per cent for the Wassermann negative cases.

TABLE III.—4+ WASSERMANN REACTION

Gravida	Number of Cases	Miscarriages Number	Miscarriages Percentage
II	26	10	38
III	18	9	50
IV	4	4	100
V	4	2	50
VI	1	1	100

Of 59 multiparæ with 4+ Wassermann reactions, 19, or 21 per cent, had had one miscarriage; 7, or 8 per cent, had had two miscarriages; 4, or 4 per cent, had had three miscarriages.

There were in this series a total of 473 miscarriages among 292 women. This is an average of 1.6 miscarriages per woman. The distribution is interesting.

TABLE IV

Among 237 Wassermann negative women, 391 miscarriages or 1.7
Among 6 Wassermann doubtful women, 15 miscarriages or 2.5
Among 5 Wassermann 1+ women, 5 miscarriages or 1.
Among 6 Wassermann 2+ women, 9 miscarriages or 1.5
Among 8 Wassermann 3+ women, 8 miscarriages or 1.
Among 30 Wassermann 4+ women, 45 miscarriages or 1.5

In six cases, the report of anticomplementary was returned, and the request for another sample was complied with. The results follow:

TABLE V

First Wassermann	Second Wassermann
Anticomplementary	Negative
Anticomplementary	Negative
Anticomplementary	Negative
Anticomplementary	4+
Anticomplementary	Anticomplementary
Anticomplementary	Negative

A few other facts appear worthy of some mention. A woman gave a history of having had 16 miscarriages in 19 pregnancies. Her blood Wassermann was repeatedly negative.

Another woman had miscarried ten times previously, and was in her eleventh pregnancy with a negative Wassermann.

No 4+ positive Wassermann patient gave a history of having been pregnant more than six times.

Of the 1,320 cases, only one gave a history of having had syphilis. She was a patient of the Department of Dermatology and Syphilis of the Vanderbilt Clinic, and the treatment under the direction of Professor J. A. Fordyce had rendered her blood Wassermann negative. This patient had been infected by her husband, although he had not had an active manifestation during his wedded life. The woman had never had a clinical symptom. Her Wassermann had been done on the occasion of the discovery of a positive Wassermann in the husband taken because he suffered with chronic headache. Both husband and wife were under antisyphilitic treatment at the time conception took place.

SUMMARY

We found that among 1,320 pregnant women, 87 per cent were Wassermann negative. Only 6.7 per cent gave a 4+ positive reaction, and in 2 per cent more of the cases, the Wassermann was 3+ positive. Of the Wassermann negative multipara, 37 per cent had suffered one or more miscarriages as compared to 52 per cent of the 4+ positive cases.

Only one woman among the 1,320 gave a history of having been known to be infected with syphilis, although approximately one woman out of each 11 gave a strongly positive Wassermann reaction, indicating in all probability, a syphilitic infection. In perhaps every instance, the husband was responsible for the disease in the wife. And yet, there are hospitals throughout the land that refuse to admit men suffering with syphilis. "As they sow, so shall they reap" is the attitude of the hospital board. The diseased wife, and the unborn syphilitic offspring is the result. Every case of syphilis may become the center of an ever-widening circle of infection. Nip the center in the bud! Treat syphilis early! Treat it efficiently! Treat it every time!

THE USE OF POTASSIUM-MERCURIC-IODIDE FOR SKIN DISINFECTION

By WILLIAM FRANCIS McKENNA, M.D., and HENRY ANDREW FISHER, M.D., Brooklyn

MODERN textbooks of surgery, in describing various methods for disinfecting operative sites, give preference to tincture of iodine. The earlier use of wet compresses or packs of bichloride of mercury has been largely abandoned on account of the harmful effect on the epithelial cells. Because of the affinity of this mercury salt for proteins, a direct chemical combination takes place between the cell protoplasm and mercury, resulting in coagulation. This injury to the epidermis lowers the resistance of the tissue, rendering it more susceptible to subsequent infection.

The choice of tincture of iodine apparently is based on clinical experience rather than on any exact experimental data concerning its bactericidal action on the microbial flora of the human skin. This tincture is said to penetrate the follicles more readily than do other germicides, and, while it is supposed to render the skin sterile, there are few references in the literature which fully substantiate this view. On the other hand, the official preparations possess certain drawbacks. Applied to delicate skins irritation is produced, leading to marked dermatitis in some patients. Owing to the tendency of the tincture to spread, the iodine becomes more concentrated at the periphery of the painted area and blistering sometimes takes place. In cases of hyperthyroidism, where a hypersensitiveness to iodine exists, the use of any solution or tincture containing free iodine is contra-indicated. Furthermore, iodine is irritating to such delicate tissues as the peritoneum, and great care must be exercised to guard against any contact between the viscera and the painted edges of the wound in order that subsequent adhesions may be prevented.

Because of the objectionable features of both mercuric chloride and iodine, it was deemed desirable to study the applicability of some other germicide for skin disinfection. For several reasons the double salt of mercury and iodine — potassium-mercuric-iodide — seemed preferable to either of these agents. That it possesses high bactericidal potency has been shown by Macfarlan (1), while Watson (2) reported that in alcoholic solution it was ten times as potent as similar solutions of iodine. It ranks with mercuric chloride in bactericidal efficiency and is superior to it in several other respects. It is readily soluble in water, alcohol and acetone, and in its watery solution does not coagulate albumin. It is far less irritating to the tissues than either mercuric chloride or iodine, and is free from the escharotic action of the latter.

The favorable experience of the authors in the use of this double iodide, both as a general disinfectant and as an antiseptic in the treatment of infections led to the following experiments, designed to test its efficiency in disinfection of the skin.

EXPERIMENT I

The efficacy of any skin disinfectant depends upon its power of penetrating the superficial layers of the skin. The following experiment was planned to give information concerning the extent to which iodine and potassium-mercuric-iodide permeate the sound epithelium. As a control, an acid dye of the phthalic anhydride group—Rose Bengal—was used, because such substances are known to be markedly diffusible in animal tissues.

TECHNIQUE

The skin over the thorax and abdomen of an albino guinea pig was closely shaved, washed with water and then with alcohol. When dry, circular areas about 2 centimeters in diameter were treated as follows:

Area 1. Painted with 7 per cent official tincture of iodine, two minutes later excised and placed in 10 per cent formalin in isotonic salt solution.

Area 2. Same as Area 1, but at the end of two minutes received a second coat of iodine and three minutes later excised.

Area 3. Painted with a 1 per cent solution of potassium-mercuric-iodide in 70 per cent alcohol. Two minutes later painted with 30 per cent ammonium sulphide solution to precipitate the mercury as the sulphide in the tissues. When dry, was excised and fixed.

Area 4. The same as Area 3, but two minutes after first coat it received a second coat of alcoholic potassium-mercuric-iodide, and three minutes later was painted with ammonium sulphide. When dry, was excised and fixed.

Area 5. Painted with a 1 per cent solution potassium-mercuric-iodide in acetone. Procedure same as with Area 3.

Area 6. Painted with a 1 per cent solution potassium-mercuric-iodide in acetone. Procedure same as with Area 4.

Area 7. Painted with a 1 per cent solution of Rose Bengal, two minutes later received a second coat of this solution, then mordanted with 1 per cent tannic acid.

The pieces of skin were embedded in paraffin and cut at 15 μ.

OBSERVATIONS

Areas 4 and 6 show a dense and even deposit of mercury sulphide in the epidermal layer, but no penetration of the true skin. The density of sulphide is greater in 6 than in 4.

Area 7 shows a dense and uniform staining of the epidermal layer but no penetration of the true skin.

Areas 1 and 2 show a slight staining of the epidermal layer.

The results show further that potassium-mercuric-iodide penetrates the skin equally as well as the fluorescein dye, and permeates the epidermis.

EXPERIMENT II

In order to determine the ability of skin to absorb potassium-mercuric-iodide the following experiment was carried out:

TECHNIQUE

Pieces of guinea pig skin, shaved, were placed flat on a smooth sheet of glass, and a glass funnel inverted over the central portion of each. A thick coating of paraffin was then applied over the outside of the funnels and over the skin and glass external to the rims of the funnels. Watery solutions of 1.0, 0.2, 0.1, and 0.01 per cent potassium-mercuric-iodide, respectively, were then poured through the necks of the funnels and allowed to remain in contact with the skin for 24 hours. After this time the unexposed skin was carefully cut from the exposed portions, the skin washed repeatedly in water to remove any excess of potassium-mercuric-iodide and treated as follows: the tissue was digested with sulphuric and nitric acids until a colorless solution was obtained. After cooling, the solution was diluted and made alkaline with ammonium hydroxide. Nitric acid and ferric ammonium sulphate were added and the solution titrated with N/10 potassium sulphocyanide to the production of a permanent yellow color. The amount of potassium sulphocyanide used gave the quantity of mercuric nitrate present and from this the equivalent in potassium-mercuric-iodide was calculated. The findings are shown in Table I.

TABLE I.—ABSORPTION OF POTASSIUM-MERCURIC-IODIDE BY THE SKIN

Experiment	Skin area exposed	Strength of potassium-mercuric-iodide solution	Total Hg. (Nos) found in total skin area	Total Hg (Nos) calculated as HgI_2	Calculated as K_2HgI_4 per 1 cm^2 skin	Concentration K_2HgI_4 in skin
	Cm. 2		Gms.	Gms.	Gms.	By weight
I	19.635	1:100	0.2071	0.2899	0.0254	1: 4,000
II	31.172	1:500	0.06167	0.0863	0.0046	1:21,000
III	30.19	1:1000	0.02272	0.0318	0.0018	1:55,000
IV	33.18	1:10000	0.00243	0.0034	0.00017	Negligible

TABLE I.—ABSORPTION OF POTASSIUM-MERCURIC-IODIDE BY THE SKIN

These experiments would seem to show that guinea-pig skin absorbs appreciable amounts of potassium-mercuric-iodide, and that the absorption varies directly in proportion to the solution concentration of the salt. By calculating the actual amount of double iodide present in one square centimeter of skin it would appear that the application of a 1:100 solution produces an actual concentration of the salt in any given skin area equal to 1:4000. Since the potassium-mercuric-iodide is in watery solution and is applied to tissues having a normal water content, dissociation of the salt takes place, and it is reasonable to assume that it exerts a germicidal action comparable to the germicidal action *in vitro* of a similar solution. That this assumption is not unwarranted is attested by the experiments described below.

EXPERIMENT III

The object of the following experiments was to study the disinfecting power of solutions of potassium-mercuric-iodide when applied to the skin. The method adopted was planned to conform with the best procedure employed in applying iodine tinctures and solutions preparatory to surgical operations. Two modifications were introduced for the purpose of making the conditions of the experiment more exacting than the conditions obtaining in the usual surgical practice.

TABLE II

Experiment III	Guinea Pigs No. 1 and No. 2					
		Time of	Incubation			
Solution	Strength	Exposure	24 Hours	48 Hours	72 Hours	Remarks
Potassium-mercuric-iodide in 70 per cent alcohol ...	1:100	2 minutes	O	O	X	Staphylococcus at 72 hours
	1:100	5 minutes	O	O	O	Remains sterile
Tincture of iodine U. S. P.	7 per cent	2 minutes	O	X	X	Sporulating bacillus, no staphylococcus
Tincture of iodine U. S. P.	7 per cent	5 minutes	O	X	X	Sporulating bacillus, no staphylococcus
Control A. Alcohol	70 per cent	5 minutes	X	X	X	Sporulating bacillus and staphylococcus
Control B. Untreated	.....	.....	X	X	X	Sporulating bacillus and staphylococcus

TABLE III

Experiment IV	Guinea Pigs No. 3 and No. 4				
		Time of	Incubation		
Solution	Strength	Exposure	24 Hours	48 Hours	Remarks
Potassium-mercuric-iodide in acetone	1:500	2 minutes	O	X	Staphylococcus
	1:500	5 minutes	O	X	Staphylococcus
Potassium-mercuric-iodide in acetone	1:250	2 minutes	O	X	Staphylococcus
	1:250	5 minutes	O	X	Staphylococcus
Potassium-mercuric-iodide in acetone	1:100	2 minutes	O	O	Sterile
	1:100	5 minutes	O	O	Sterile
Control A. Acetone	100 per cent	5 minutes	X	X	Staphylococcus
Control B. Untreated	.....	.....	X	X	Staphylococcus

Washing the shaved skin with soap or alcohol preparatory to applying the disinfecting solution was omitted in order not to disturb or diminish the normal bacterial flora of the skin. Furthermore, after the desired exposure to the action of the germicide, the skin was thoroughly washed in sterile saline for the purpose of removing any of the germicide remaining free on the surface of the skin, which might be carried over into the culture medium and exert an inhibiting action on any organisms present.

TECHNIQUE

The skin over the abdomen of an etherized guinea pig was closely shaved, the soap removed with water and the skin allowed to dry. Several hours later separate areas of about 2 centimeters square were then painted with (a) a 1:100 solution of potassium-mercuric-iodide in 70 per cent alcohol and (b) 7 per cent tincture of iodine. At the end of two minutes a square of skin (about 1 centimeter square) was excised under aseptic precautions, washed for five minutes through two solutions of sterile saline, and then dropped into tubes containing 30 cubic centimeters of 1 per cent dextrose broth (reaction×1.0). Other squares were given a second painting three minutes after the first application, excised two minutes later, or five minutes after the first application, then washed, and planted in broth as above. A similar square was painted with 70 per cent alcohol, then excised after the desired interval, washed in saline as above and planted in broth. Incubation was at 37.5.° All tests were repeated at least twice.

Table II shows that a 1 per cent solution of potassium-mercuric-iodide is fully equal, if not superior to 7 per cent tincture of iodine in its sterilizing action on human skin. The comparison is in favor of the former, because the concentration of the salt is only one-seventh that of the tincture. The fact that the skin treated with one application of either double iodide or iodine tincture and excised two minutes after exposure yielded no growth in broth after 24 hours' incubation would seem to show that the micro-organisms situated at or near the surface of the skin were killed. It is likely that the appearance of growth after longer incubation is due to a few surviving organisms which in their deeper, and, therefore, more inaccessible position in the tissue escaped the action of the germicide, and were only released after a softening and permeation of the skin by the culture medium.

EXPERIMENT IV

Since rapid drying of the disinfecting solution is an advantage, the double iodide dissolved in acetone was employed in this experiment. This hydrocarbon possesses the advantage of having a solvent action on the natural fats of the skin, and of rapidly evaporating. It was felt that such a medium would favor penetration of the double salt. (Table III.)

This experiment confirms the results of

TABLE IV

Experiment V — Guinea Pigs No. 5 and No. 6

Solution	Strength	Time of Exposure	Incubation 24 Hours	Incubation 48 Hours	Remarks	Incubation 24 Hours	Subcultures 0.2 ccm. of 48 Hour Cultures in 30–40 ccm. fresh broth Remarks
Potassium-mercuric-iodide in 70 per cent alcohol....	1:500	2 minutes	O	X	Spore-bearing bacillus and staphylococcus	X	Spore-bearing bacillus and staphylococcus
		5 minutes	O	X		X	
Potassium-mercuric-iodide in 70 per cent alcohol....	1:250	2 minutes	O	X	Spore-bearing bacillus and staphylococcus	X	Spore-bearing bacillus and staphylococcus
		5 minutes	O	X		X	
Potassium-mercuric-iodide in 70 per cent alcohol....	1:100	2 minutes	O	X	Same bacillus but no staphylococcus	X	Spore-bearing bacillus but no staphylococcus
		5 minutes	O	X		X	
Tincture of iodine U. S. P...	7 per cent	2 minutes	O	X	Same bacillus but no staphylococcus	X	Spore-bearing bacillus but no staphylococcus
Control A. Alcohol.....	70 per cent	5 minutes	X	X	Same bacillus and staphylococcus	X	Spore-bearing bacillus and staphylococcus
Control B. Untreated	.....	.....	X	X	Same bacillus and staphylococcus	X	Spore-bearing bacillus and staphylococcus

Experiment II and shows further that acetone is a desirable solvent for potassium-mercuric-iodide when used for skin disinfection.

The question arose whether the failure of the treated skin to show any bacterial growth in the culture medium was due to a possible inhibitory effect of the double iodide absorbed by the skin and liberated in the broth, or whether the lack of growth was in reality due to a killing of the bacteria. To determine this question the following experiment was done:

EXPERIMENT V

The technique was precisely the same as in the foregoing experiments. At the end of three days' incubation, 0.2 cubic centimeters of the broth containing the treated skin was transferred to tubes containing 30 to 40 cubic centimeters of freshly sterilized broth. This volume gave sufficient dilution to overcome any possible inhibiting action on the part of the potassium-mercuric-iodide given up by the skin to the broth culture. (Table IV.)

DISCUSSION

The experiments detailed above disclose the fact, formerly known but not always appreciated, that the application of germicidal solutions to the skin kills bacteria on the surface and many of the organism in the skin follicles, but does not effect absolute sterilization of the skin.

The location of micro-organisms in the hair or sebaceous follicles and in sweat ducts; the presence of fats in these follicles, preventing contact between the bacteria and the bactericide; and the fact that no chemical may be used in a concentration so great as to injure the tissue cells, are factors which militate against absolute sterilization of the skin. The results obtained, however, show conclusively that solutions of potassium-mercuric-iodide or tincture of iodine in dilutions free from any harmful action, are efficacious in killing bacteria on and in the skin, and therefore must be considered as having a definite value in lessening the possibilities of bacterial infection in surgical operations as well as in the treatment of traumatic wounds. These experiments also show that potassium-mercuric-iodide in a concentration of 1:100 in acetone or in 70 per cent alcoholic solution is more efficient for this purpose than is the official tincture of iodine. The greater penetration of the potassium-mercuric-iodide in acetone as shown in Experiment I, and the more rapid evaporation of this solvent make this solution the most desirable one for use. Furthermore, solutions of this double iodide do not stain, and produce no irritation or blistering of the skin. In these respects, therefore, potassium-mercuric-iodide in a strength of 1 per cent in 70 per cent alcohol—or better, in acetone—is preferable to iodine for the disinfection of the skin.

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A STUDY OF THE ARTERIES SUPPLYING THE STOMACH AND DUODENUM AND THEIR RELATION TO ULCER

By T. B. REEVES, M.D., Rochester, Minnesota
Fellow in Surgery, Mayo Foundation

THIS work was undertaken to determine, if possible, whether there is any difference in the character of the arteries in the stomach and duodenum, in the regions in which ulcers are prone to occur. At the operating table practically all ulcers of the stomach are found along the lesser curvature, and 98 per cent of the duodenal ulcers are found within one and one-half inches of the pylorus; the greater number on the anterior wall within the first inch. It would seem that there must be a special factor to cause this curiously selective character.

The two portions of the bowel, the stomach, and the first one and one-half inches of the duodenum, should be considered as modified portions of the same region of the primitive alimentary tube. From an embryologic standpoint the beginning of the duodenum resembles the stomach in that it arises from the foregut. The first inch is freely movable; it is covered in front and behind by the same two layers of peritoneum that cover the stomach. The mucous surface of the first one and one-half inches of the duodenum is devoid of folds (valvaluæ conniventes), and the villi are short. The distribution of blood vessels supplying the stomach and the first one and one-half inches of the duodenum is not regular as it is in the rest of the bowel.

TECHNIQUE

Sixty-two human stomachs and duodenums procured at necropsies from 1 to 4 hours after death have been investigated. Most of the specimens were injected before being removed from the body. For injecting the arteries, slightly acid gelatin-carmin solution gave the best results. Ten per cent gelatin solution was filtered through several thicknesses of cheese cloth. Sufficient carmin to make 1.5 per cent solution was ground in a mortar and partially dissolved in a small amount of water containing a few drops of acetic acid; this was added to the warm gelatin solution and thoroughly stirred. A few crystals of thymol were added as a preservative. When ready for use, the gelatin-carmin was melted over a water bath and injected at a temperature between 45°C. and 50°C. To inject the capillaries the carmin should first be dissolved in ammonium hydroxide to eliminate the granules, then neutralized with acetic acid (Bayne-Jones). If the gelatin-carmin solution is alkaline, the dye will diffuse through the tissue and obscure smaller vessels.

All of my injections were made through the cœliac axis, the hepatic artery being ligated at the porta hepatis, and the inferior pancreaticoduodenal at its origin from the superior mesenteric. In some of the cases the splenic artery was clamped off at the hilus of the spleen.

Several injections were made to include the capillaries, but no attempt was made to inject the veins, although they were partially filled in a few instances. As a rule the best injections were in stomachs that were moderately distended either with air or fluid. Specimens distended with air soon after injection were useful when hardened and dried. Fixation of specimens in 10 per cent formalin solution for 12 to 24 hours immediately after injection proved the most instructive method, as it was then comparatively easy to make a complete dissection of the vessels of the submucosa by means of a dissecting microscope. For microscopic study, blocks of tissue were cut from various parts of the stomach and duodenum and fixed in 10 per cent formalin. Serial frozen sections from 50 to 100 microns were cut, stained with hæmatoxylin, and mounted in balsam.

A few specimens were injected with 10 per cent gelatin to which was added bismuth or barium sulphate. One specimen was injected with 15 per cent thorium and one with 25 per cent sodium bromide. Each of these

specimens was distended with air and stereoscopic roentgenograms taken. The ones containing barium or bismuth made the best roentgenograms (Fig. 1), but since they showed only the larger vessels in the submucosa, they were of little value in this study.

THE GASTRIC ARTERIAL SYSTEM

It may be well to describe briefly the larger vessels supplying the stomach and the duodenum, although my chief interest in this study was in the smaller vessels of the mucosa and submucosa of those areas of the stomach and duodenum in which ulcer is most often found.

THE CŒLIAC AXIS

The cœliac axis (arteria cœliaca) is given off from the anterior surface of the aorta between the crura of the diaphragm, a short distance below the aortic opening. It is a short, thick trunk, extends forward and slightly downward above the upper margin of the pancreas for about one-half inch, and then breaks up simultaneously just behind the posterior layer of the lesser sac of peritoneum into the gastric, hepatic, and splenic arteries.

THE GASTRIC ARTERY

The gastric artery (arteria gastrica sinistra) runs upward and to the left, crosses the left crus of the diaphragm behind the peritoneum and gains the lesser curvature of the stomach near the cardiac end by arching forward between the two layers of peritoneum which are reflected from the stomach and œsophagus on to the diaphragm. On reaching the stomach the artery gives off an œsophageal branch which soon divides into several smaller ones to supply the terminal œsophagus and a limited area of the stomach around the cardia. Just after giving of the œsophageal branches, the artery curves downward and to the right along the lesser curvature between the two layers of the gastrohepatic omentum. It soon divides into two branches, both having their path along the lesser curvature, one anterior and one posterior. In their course, these branches give off from three to five branches to the surface of the stomach next to which they travel, as well as some very small branches to the lesser curvature and to the gastrohepatic omentum. The two main branches may terminate in several different ways. Both may anastomose with the two terminal branches of the pyloric artery (arteria gastrica dextra) which in such a case is bifurcated, or only one, more frequently the posterior branch, will anastomose with the non-bifurcated pyloric artery (Figs. 2 and 3). In other cases there is no end-to-end anastomosis with the pyloric on the surface of the stomach; each branch is lost by the perforation of its secondary divisions into the muscular coats of the stomach; the anastomosis then takes place in the submucosa. Because of the absence of the pyloric artery in a very few instances no sort of anastomosis can be found. Leriche and Villemin found no anastomosis in 6 of 55 cases. In a single case of my series of 62 cases, no anastomosis could be found; this was due to the absence of the pyloric artery. From the arcade along the lesser curvature there are from 3 to 5 branches which run downward on both the anterior and posterior walls for a variable distance to penetrate the muscular coats. A second group of very small arteries enters directly through the muscular coats on the lesser curvature.

THE HEPATIC ARTERY

The hepatic artery runs slightly forward and to the right over the right crus of the diaphragm and along the upper border of the head of the pancreas behind the posterior layer of the lesser sac of peritoneum. It bends forward, crosses the left surface of the portal vein, and enters between the two layers of the gastrohepatic omentum at the upper margin of the duodenum. It then courses upward and to the right to the porta hepatis of the liver lying in the free margin of the gastrohepatic omentum in front of the portal vein and to the left side of the common bile duct. On entering between the two layers of the gastrohepatic omentum, the hepatic artery gives off the pyloric artery (arteria gastrica dextra). This vessel descends between the two layers of peritoneum to the pylorus, giving off branches both to the anterior and posterior surfaces, which usually anastomose with the duodenal vessels in the

submucosa. The artery terminates on the lesser curvature of the stomach as described. The gastroduodenal artery is given off from the hepatic soon after the pyloric. It varies from one-half to one inch in length and descends behind the first part of the duodenum about three-fourths of an inch to the right of the pylorus, where it terminates by dividing into the superior pancreaticoduodenal and the right gastro-epiploic. The right gastro-epiploic usually gives off one or two very small branches to the lower margins of the first part of the duodenum, then enters between the two layers of the gastrocolic omentum to run along the greater curvature of the stomach and anastomoses with the left gastro-epiploic from the splenic. From this arch branches are given off at much more frequent intervals than on the lesser curvature. Although arteries from the lesser curvature are fewer in number, they run a longer course (Figs. 2 and 3). The branches from both arches run in the serous coat for a short distance, then perforate the muscular layers to form a very extensive series of anastomoses in the submucosa.

THE SPLENIC ARTERY

The splenic artery (arteria lienalis) runs a rather tortuous course more or less horizontally to the left over the left crus of the diaphragm, left suprarenal and upper pole of the left kidney, and just above the upper margin of the pancreas behind the posterior wall of the lesser sac of peritoneum. On leaving the region of the kidney it enters between the two layers of the lienorenal ligament and breaks up into several branches which enter the hilus of the spleen and at the same time give off the right gastro-epiploic and several short gastric branches. These vessels enter between the two layers of the gastrolienal ligament and pass onto the greater curvature of the stomach. The left gastro-epiploic runs to the right and by anastomosing with the right gastro-epiploic it forms the arcade of the greater curvature. The short gastric branches are distributed to the left end of the greater curvature where they help to supply the fundus, and they pass to both anterior and posterior surfaces and anastomose in the submucosa with the cardiac branches of the left gastric and left gastro-epiploic arteries.

ARTERIES OF THE GASTRIC SUBMUCOSA AND MUCOSA

On examining the plexus or series of anastomoses made by the arteries in the submucosa, it is found that there is quite a marked difference between those of the lesser curvature and those of the rest of the stomach. Compare Figures 4 and 5.

All the arterial branches destined to supply the stomach penetrate the muscle coats and enter the submucosa where they form a very extensive plexus, or network of comparatively large vessels. Those from both curvatures anastomose freely with each other and reach across to anastomose with those of the opposite curvature (Fig. 4). The plexus is remarkable in that all the vessels run a very tortuous wavy course and give off branches which are to a great extent of equal size throughout the entire stomach except along the lesser curvature. Since the submucous plexus on the lesser curvature is different from that in other parts of the stomach, I shall describe it separately. It is made up by small perforating branches from the main trunks along the lesser curvature. On entering the submucosa these vessels bifurcate and run more or less parallel with each other between the œsophageal opening and the pylorus. They are much smaller, make fewer anastomoses and run more than twice the distance of the same-sized vessel in any other part of the stomach (Fig. 5). By means of rather small branches this plexus anastomoses with those on the anterior and posterior walls. The two plexus have the same relative position in the wall of the stomach, that is, midway between the inner muscle coat and the muscularis mucosa. In an injected specimen it is quite easy to dissect away either or both the mucous and muscular coats.

From the plexus of arteries in the submucosa, two systems of branches are given off; one passes to the muscular coats and the other to the mucous coat. I shall not describe the former. In many respects my findings agree with the investigations of Disse, published in 1904. The system of vessels going to the mucosa is somewhat complicated. The ves-

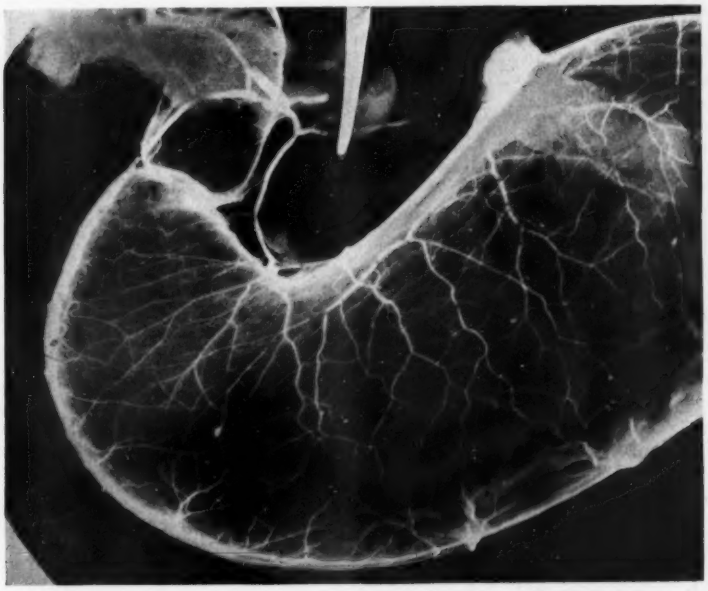

Fig. 1. Stereoscopic roentgenogram. Vessels injected with gelatin-bismuth solution.

sels run in a slanting direction toward the muscularis mucosa and at the same time take a very tortuous course. They usually divide twice before reaching the musuclaris, the branches having the same spiral-like course, often twisting about each other and in this manner passing through the muscularis mucosa. As they enter into the mucosa they suddenly become smaller by giving off branches that are terminal arteries, connected only by means of a capillary network (Figs. 6 and 7). These vessels continue to run a rather winding course and it seems that the transition from arterioles into capillaries may take place anywhere in the mucosa, but for the most part the change is in the deeper half. According to Disse (3) each end-artery supplies an area of mucosa about 2.5 millimeters in diameter. From the character and arrangement of the arteries in the submucosa, it would seem that they are well adapted for the regulation of the blood supply to the mucosa.

ARTERIES OF THE DUODENUM

The duodenum, except for its first one and one-half inches, receives its blood supply entirely from the superior and inferior pancreaticoduodenal arteries. The superior is one of the terminal branches of the gastroduodenal, and arises behind the duodenum about three-fourths of an inch to the right of the pylorus. It inclines to the right and soon divides into an anterior and posterior branch. These, however, may come off separately from the gastroduodenal (Fig. 8). The two branches run downward between the duodenum and the head of the pancreas; they are both overlapped by the thin margin of the pancreas projecting in front of and behind the margin of the duodenum. The posterior of these branches runs in intimate relation with the lower portion of the common bile-duct (Figs. 3 and 8). The inferior pancreaticoduodenal is given off from the superior mesenteric just before the latter passes in front of the third part of the duodenum. It runs to the right behind the superior mesenteric vein and soon divides into anterior and posterior branches which run along between the duodenum and the pancreas to anastomose with the two branches of the superior pancreaticoduodenal, thus making two arcades

Fig. 2. Dissection, illustrating the blood supply of the stomach and duodenum. Note the number of vessels along the greater curvature in comparison with the lesser.

in the curvature of the duodenum, as shown in Figures 3 and 8. From these two arcades, branches pass quite regularly to the anterior and posterior walls of the duodenum and tend to encircle the bowel. After reaching the bowel they soon pierce the muscular coats and form a submucous plexus by a series of anastomosing arcades (Fig. 9). This plexus is made up of a series of branches given off from the larger arteries encircling the bowel. These branches anastomose with each other; they are short and relatively of the same length and caliber. The encircling vessels become gradually smaller until finally they are the same size as the anastomosing branches. Under these conditions it seems that the blood pressure must be the same in all branches entering the mucosa, thus insuring a constant blood supply to all parts of the mucosa. From the submucous plexus, vessels are given off to supply the muscular coats; these vessels will not be described here. The greater part of the blood stream is carried to the mucosa through two sets of arteries; one to the villi, and one to the lower ends of the crypts. On piercing the muscularis the arteries give off a variable number of branches to the villi; there being usually one to each villus. This artery passes almost through the center and terminates in capillaries near the summit (Fig. 10). The crypt type of artery, on entering the mucosa, divides into several branches which radiate in all directions, and run along the bases of the glands (Mall, 9). These in turn give off branches which pass upward around the glands and soon terminate in capillaries which supply the glands and stroma (Fig. 10).

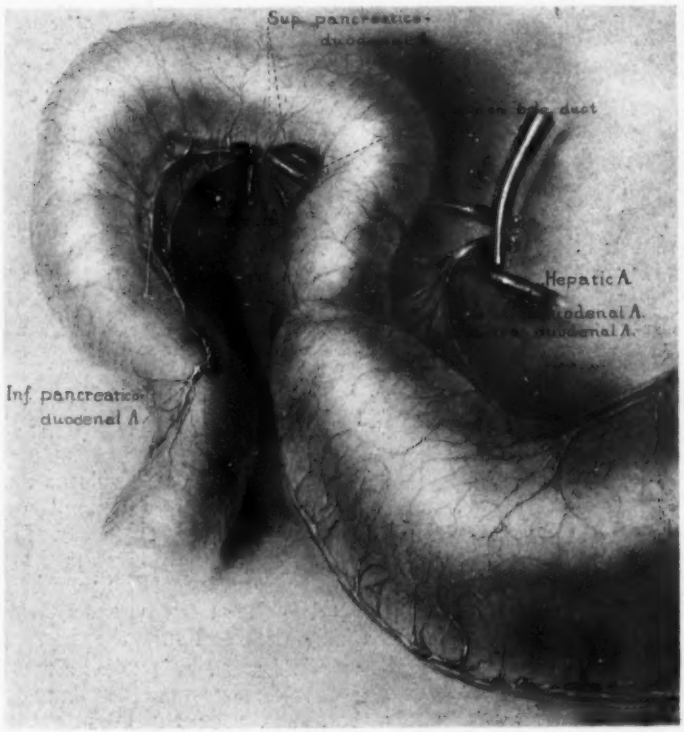

Fig. 3. Dissection showing the blood vessels and their relations to the pyloric end of the stomach and the duodenum. Anterior view. Pancreas dissected away.

The first one and one-half inches of the duodenum receives its blood supply chiefly from an artery which is usually given off from the gastroduodenal or hepatic. This vessel has been described at length by Wilkie under the name of "supraduodenal artery." From its origin, as shown in Figures 2, 3, and 11, it runs downward between the two layers of the lesser omentum to the upper margin of the duodenum. Here it gives off a small branch to the posterior surface of the duodenum while the main vessel comes on the anterior surface to anastomose rather sparingly with a small branch of the pyloric, a small branch of the right gastro-epiploic, and with branches of the superior pancreaticoduodenal (Fig. 11). The posterior wall of the first one and one-half inches of the duodenum is supplied chiefly by small branches from the gastroduodenal artery, given off as that vessel passes behind the bowel. It also receives some small twigs from the supraduodenal, pyloric, and right gastro-epiploic arteries. These arteries, soon after reaching the wall of the duodenum, penetrate the muscular coat and form a submucous plexus which is strikingly different from that lower down in the bowel. Compare the first and second halves of Figure 11. The first inch certainly has very few arteries in the submucosa in comparison with other parts of the duodenum. It would seem that this explains the observation of W. J. Mayo regarding the "anæmic spot" produced by traction, usually seen on the surface of the bowel in this region. From the submucous plexus of vessels, branches are given off to the mucosa which simulate to a marked degree the vessels of the stomach. They are not quite so large nor do they run so consistently

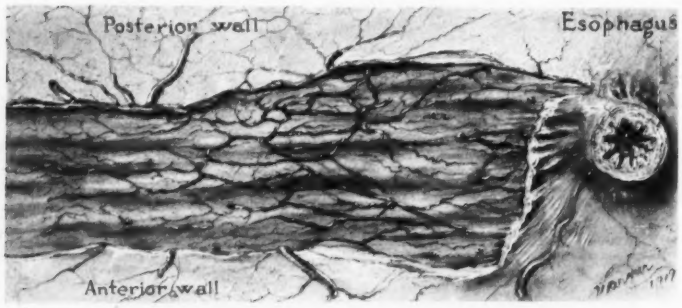

Fig. 5. Dissection illustrating the submucous plexus of arteries on lesser curvature of stomach. Note their length, size, and general direction.

tortuous a course. Yet many are definitely of the spiral gastric type; this is particularly noticeable just as they enter the muscularis mucosa (Figs. 12 and 13). Beside the gastric type of crypt vessels in the first inch of the duodenum is the villus type; and since the villi are not so numerous nor so high as they are farther down in the bowel, these arteries are correspondingly modified (Fig. 14). There are possibly a few more arteries in the submucous plexus on the posterior than on the anterior wall of this portion of the duodenum; otherwise the blood vessels are similar.

The transition from stomach to duodenum is not sharply marked either in the mucosa or in the submucosa. Brunner's glands are often found in the pylorus and the pyloric glands frequently extend over into the duodenum (Bailey). In fact, Brunner's glands are believed by Oppel and others to be a continuation of the pyloric glands. Certainly the gastric type of artery is carried over into the duodenum, the change being gradual.

Fig. 4. Arteries of the submucosa of the posterior wall of the stomach. Note the winding tortuous course of the smallest branches. Dissection photograph.

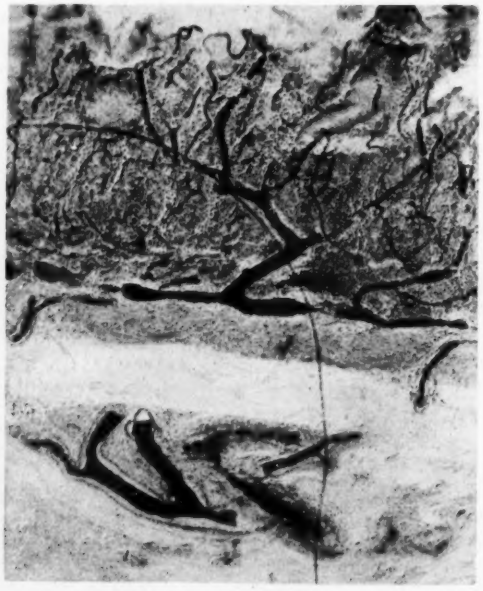

Fig. 6. Arteries of the stomach mucosa with a few capillaries injected. Photomicrograph (x 50).

According to Mall (8) the crypt vessels of the small intestine become submucous vessels in the stomach and the arteries to the villi become smaller and are the stellate vessels of the mucosa in the stomach.

THE SIGNIFICANCE OF GASTRIC AND DUODENAL ARTERIES IN RELATION TO ULCER

The character of the arteries of the submucosa and of the mucosa of the stomach from a normal as well as from a pathologic standpoint has a physiologic significance. The glands secrete chiefly during digestion when the walls of the stomach are expanded; during this period they need a rich blood supply. From a physiologic standpoint it is of advantage to the organism if the flow of blood to the capillaries of the mucosa is made less difficult when the stomach is filled, and that the blood supply is limited when the stomach is empty. With a full stomach, when the walls are expanded, all of the rugæ or folds of the mucosa disappear except two along the lesser curvature; all the winding spiral curves and marked tortuosities of the arteries are straightened out, except those along the lesser curvature; thus the resistance offered the blood stream by the very tortuous arteries decreases and the flow of blood to the mucosa is made less difficult (Waldeyer). Of course, there is undoubtedly a nervous influence at work at the same time, causing a dilatation of the vessels. But the latter influence is entirely separate and distinct from the mechanical resistance offered by the vessels. As the stomach empties itself and becomes gradually smaller following digestion, the arteries of the mucosa and submucosa become more tortuous and the blood meets with greater resistance. Thus the blood content of the mucosa is not nearly so great in an empty as in a full stomach.

Among the most generally accepted theories advanced regarding the etiology of gastric and duodenal ulcer is the theory that they are caused by a hæmatogenous infection. The clinician and the surgeon in their attempts to establish a cure for ulcer are realizing more and more that they are dealing with an infectious process.

Pathological changes in the vessels result in marked changes in the blood flow, due not only to the partial obstruction, but also to the diminished elasticity and contractility of the arterial walls. Virchow was among the first to call attention to the fact that thrombosis or other vascular lesions producing obstruction of the vessels in the gastric mucosa results in hæmorrhagic necrosis which, in the presence of the gastric juice, leads to ulcer. A local endarteritis producing practically an obstruction of a vessel, which makes few or no anastomoses and supplies a relatively large area of the mucosa, probably causes a chronic gastric ulcer in rare instances in elderly persons, just as superficial ulcers and even gangrene are produced elsewhere by the same cause. This type of ulcer will not heal, probably because of the lack in power of the diseased vessels to regenerate new ones to supply the affected area with arterial blood. Various observers in their attempts to produce gastric and duodenal ulcer by disturbing the circulation have shown that embolism of the vessels entering through the muscularis mucosa gives the most pronounced results. The collateral circulation of the vessels in the submucosa is so great that one of the four large vessels passing on to the wall of the stomach may be ligated without causing harm to the stomach (Baumann.) The collateral circu-

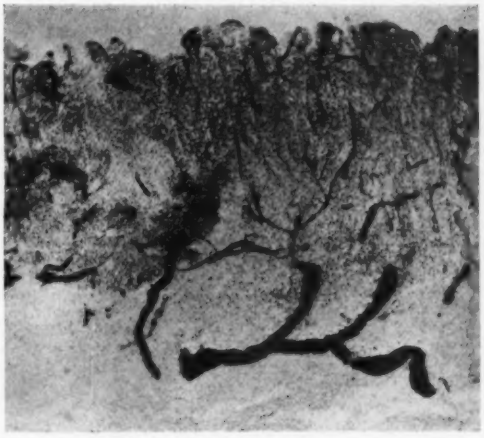

Fig. 7. Vessels entering the gastric mucosa. Note the sudden diminution in size of the vessels. Many branches are not injected because of plugging with carmin granules. Photomicrograph (x 50).

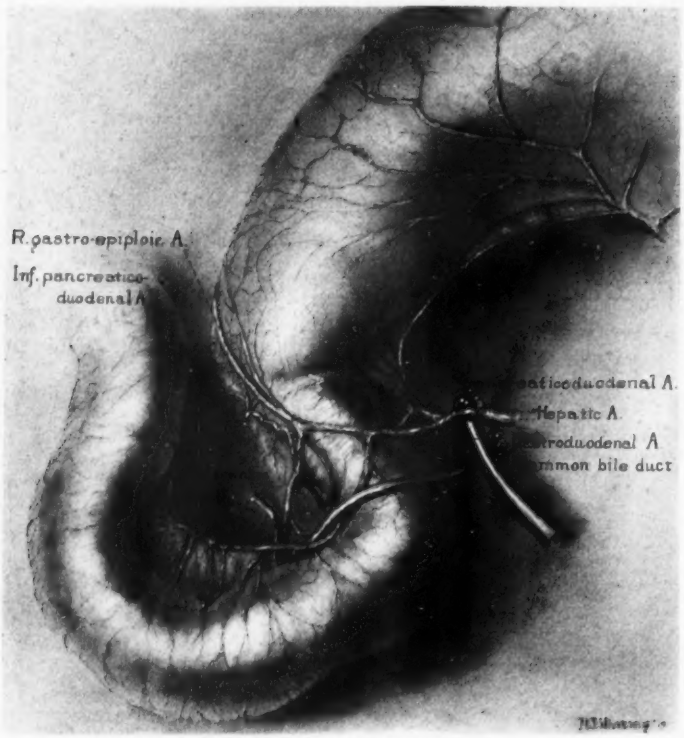

Fig. 8. Dissection drawing showing the blood vessels and their relations to the pyloric end of the stomach and the duodenum. Posterior view. Pancreas dissected away.

lation in the mucosa, however, is limited, for the most part, to capillaries.

Cohnheim, in 1890, produced acute ulcers by the injection of foreign substances into the gastric circulation. In these cases the injecting material seemed to occlude the vessels entering the muscularis mucosa and to cut off the circulation to a limited area of the mucosa. The action of the gastric juice on the dead or devitalized tissue probably contributed to the production of acute ulcers. This type of ulcer heals readily since there is nothing to cause additional destruction of tissue, and since the natural tendency of the body is to repair the damage done.

Rosenow injected streptococci isolated from gastric and duodenal ulcers in man into the venous circulation of experimental animals and produced gastric and duodenal ulcer in 60 per cent, and a total of ulcer and hæmorrhage in 83 per cent of the animals injected. I quote from his summary: "The ulcers produced by the injection of streptococci resemble those in man in location, in gross and microscopic appearance, and in that they tend to become chronic, to perforate, and to cause severe or fatal hæmorrhage." According to Rosenow's description, "both the circumscribed hæmorrhage and the ulcer are cone-shaped with the base of the cone at the surface and the apex at the muscularis." From the anatomic arrangement of the vessels in the mucosa, this circumscribed area of hæmorrhage is just what one would expect from thrombosis or disturbance of the circulation of the vessels entering through the muscularis mucosa. Since this type of ulcer is produced by strepto-

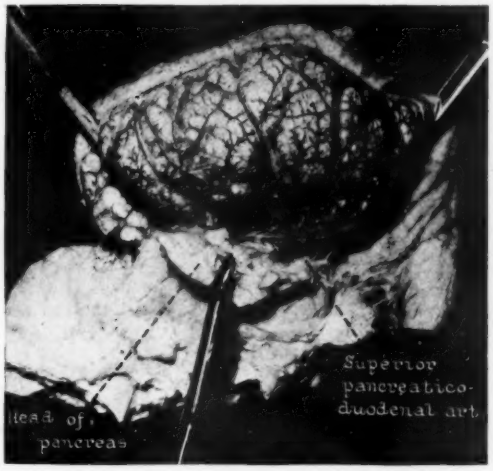

Fig. 9. Anterior wall of the second part of the duodenum; muscular flap dissected away. Photograph of specimen.

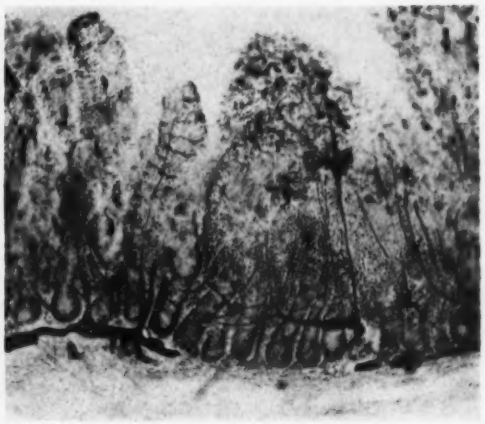

Fig. 10. Villus and crypt type of arteries in duodenum. Capillaries injected. Photomicrograph (x 50).

cocci, it tends to become chronic and to have all the characteristics of ulcer in man; the streptococci serve as a constant irritant and prevent healing. The continued action of the localized infection in the deep layers produces local circulatory disturbance, hæmorrhage, anæmia, etc. Since the gastric juice digests devitalized tissue, and since the vascularization of the underlying tissue may become gradually less, perforation may be the final outcome.

As has been stated, the rugæ of the stomach mucosa disappear with expansion of the walls. There are two folds, however, one anterior and one posterior, along the lesser curvature extending from the œsophageal orifice toward the pylorus which do not disappear (Waldeyer). Lewis has shown these folds on his reconstruction models of the stomach in the human fœtus. He has described a canal along the lesser curvature which he named "canalis gastricus." Waldeyer in his review of this subject states that these folds become larger with the filling of the stomach and finally form a canal running lengthwise of the lesser curvature. When a stomach is distended with air or fluid even to the point of rupture, the lesser curvature takes comparatively little part in the distention and the break always occurs at the fundus. I have noticed particularly that it is more difficult to get a good injection of the vessels in the mucosa of the lesser curvature than elsewhere, even with distention of the stomach. This is also true of the first inch of the duodenum. Mall (9), in his work on the stomachs of dogs, reports similar difficulties in injecting the vessels of the pylorus and of the beginning of the duodenum.

The vessels of the mucosa on the lesser curvature are not essentially different from those in the rest of the gastric mucosa. But the arteries making up the submucous plexus

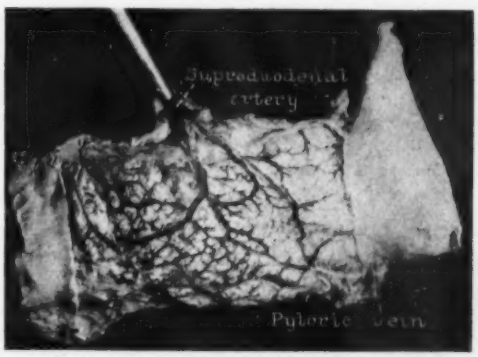

Fig. 11. Dissection photograph showing submucous plexus of arteries. First part of duodenum. Note how few vessels are in the first inch.

Fig. 12. Gastric type of spiral artery in the duodenum. Branches plugged with carmin granules, hence no other vessels in the field. This is in itself suggestive of a terminal artery. Photomicrograph (x 100).

are very much smaller and make longer anastomoses than those in the rest of the submucosa. Due to the permanent folds, the vessels along the lesser curvature do not have so great an opportunity to straighten out with moderate distention as those in other parts of the stomach. Thus the resistance offered the blood stream by the much smaller and constantly winding tortuous arteries is never removed. As a result the blood current entering the mucosa is constantly slower and at a lower pressure than in any other region of the stomach. Hence it seems the arteries are more liable to thrombosis.

As I have stated the arteries making up the submucous plexus in the first inch of the duodenum are comparatively few in number. They are rather small and do not anastomose freely. From this plexus we find along with others the gastric type of spiral tortuous artery entering the mucosa. The mucous lining is practically devoid of folds; distention, therefore, has little effect toward the straightening out of these vessels. The rather limited blood supply in itself to this area of the duodenum probably causes a slower blood current. Further, the presence of the gastric type of artery offers a remarkable resistance to the blood stream. Due to these conditions it seems that the arteries of the first inch of the duodenum are more liable to thrombosis than those of any other region.

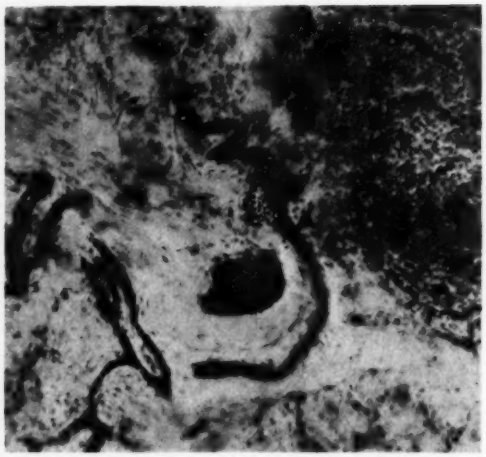

Fig. 13. Gastric type of spiral artery entering mucosa of duodenum. Branches plugged with carmin gelatin. Photomicrograph (x 100).

CONCLUSIONS

This investigation shows that the anatomic arrangements of the arteries along the lesser curvature of the stomach and throughout the first inch of the duodenum are such that the arteries are predisposed to thrombosis. The plexus of vessels in the submucosa on the lesser curvature is made up of much smaller and longer arteries without as free anastomoses as in other regions of the stomach. The branches from this plexus run a very tortuous course to enter the mucosa. The resistance offered the blood stream is constantly greater and, as a result, the blood current is slower as it enters the small arteries of the mucosa. The submucous plexus of arteries in the first inch of the duodenum is made up of relatively few vessels in comparison with other parts of the duodenum. They are small and do not anastomose freely; they

give off branches to the mucosa some of which simulate the gastric type of spiral artery. The rather limited blood supply and the gastric type of artery predispose to thrombosis. Since the vessels are more liable to be occluded by emboli, it is reasonable to suppose that they are an important factor in the production of ulcer by hæmatogenous infections.

By these observations I wish to call attention to the character and distribution of the smaller arteries in stomachs and duodenums altogether anatomically normal, and to submit the hypothesis that possibly slight deviation from the normal may contribute to peptic ulcer. In any consideration of ulcer it must be remembered that this disorder is relatively and actually rare; according to Osler ulcer is found at 1.32 per cent of all necropsies performed in the United States and in Canada. Finally, it must be remembered that high grade bacteræmias do not frequently produce gastric or duodenal ulcer.

Fig. 14. Gastric type of artery in first inch of the duodenum, giving off villus branches. The smaller cryptic branches are plugged with injecting material. Photomicrograph (x 50).

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PNEUMOPERITONEUM

By B. H. ORNDOFF, A.M., M.D., Chicago

THE purpose of this paper is to draw attention to the possibility of aid in the diagnosis of gynecological conditions afforded by the X-ray after pneumoperitoneum has been produced. Pneumoperitoneum indicates that the peritoneal cavity has been inflated with gaseous media. Medical literature shows the first record of this work in diagnosis to have been done in Europe, and that it was introduced in America by W. H. Stewart and Arthur Stein, of New York (1).

For purposes of diagnosis, it is necessary to use a sufficient amount of gas to enlarge the general peritoneal cavity to such extent that the organs may be displaced from contact with other organs and tissues. In this way the margins of the organ under consideration are contrasted for density with the gaseous media. It is obvious that by this means the outline, size, position, volume, intrinsic variation of density, etc., may be demonstrated by the X-rays.

The most important findings are exhibited in the fluorescent screen. Plates or films not only offer permanent record but because of the better detail are frequently quite necessary.

The position of the patient for examination must be such as to permit the gas to accumulate in the cavity of the true pelvis and at the same time allow the organ which is to be examined to become separated from other tissues. This may be accomplished by elevating the hips above the level of the shoulders. It is frequently necessary to palpate the organs in order that their identity and character may be revealed.

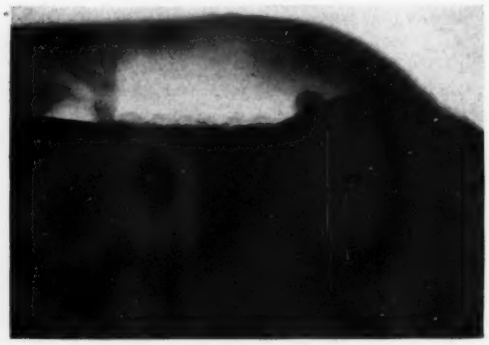

Fig. 1.

The plane at which the X-rays are used during the observations is very important. The apparatus should permit considerable variation in this regard in order that the organ may be viewed from different angles.

The examination may be carried out with the patient lying face downward while the rays are directed perpendicularly, as from the horizontal fluorescent screen apparatus. The patient may lie with the right or the left side upward, the rays being directed in a horizontal direction as before an upright fluorescent screen apparatus. The pelvis must remain elevated above the shoulders.

The gaseous media of preference is oxygen. Air, nitrogen, and carbon dioxide have been used. The amount varies from 1 to 4 liters, but there seems to be no advantage in measuring the quantity used.

The apparatus and technique used by the author were described in the *Journal* of *Roentgenology* (2).

By this method the pelvic organs, i.e., the uterus, round ligament, oviduct, and ovary may

Fig. 2.

Fig. 3.

Fig. 4.

be visualized and palpated synchronously. The diagnostic value of thus being able to palpate from two directions any of the genital organs, that is bimanual vaginal palpation, and at the same time visualize the position, density, fixation, etc., is self-evident.

Some of the conditions in which this procedure has proved useful to the author are fibroids, pregnancy, extra-uterine pregnancy, ovarian cysts and tumors, peritoneal adhesions with visceral fixation, pyosalpinx, etc. The differential diagnosis of conditions of the rectum, bladder, ureters, intestines and other organs of the pelvis have also been greatly facilitated.

The writer wishes to express his sincere thanks for the valuable suggestions and helpful co-operation of the members of the staff of the Frances Willard hospital.

REPORT OF CASES

Case 1. No. 3534. Mrs. . . Cardinal symptoms referable to the pelvis. Dysuria and constipation were noted. The diagnosis made from physical findings was multiple myofibromata of the uterus.

Figure 1 is a lateral view roentgenogram with the patient lying face upward. The pneumoperitoneum has lifted the anterior abdominal wall far from the surface of the intestines. The iliac bone is entirely obscured by the dense shadow of the fibroid. From the margin of the fibroid a small subserous fibroid is noted, the size of an English walnut.

Case 2. No. 3432. Mrs. R. Cardinal symptoms referable to the genital organs. The patient has been married for 3 years, is 31 years old, and gives a history of scanty menstruation for 8 years. There is no history of conception which is the consideration that prompted the examination.

Figure 2 shows some of the X-ray findings. The uterus with the right oviduct is observed as a spindle-shaped body just above the pubic bones. It is observed that the uterus lies to the left of the median line, apparently because of the fixation of the left oviduct, as observed in the fluorescent screen and bimanual vaginal examination. The uterus is below normal size as observed by comparison with other illustrations.

Case 3. No. 3365. Mrs. K. Cardinal symptoms, abdominal distress but little pain. The patient gave a history of dysmenorrhœa and constipation. She has been married 8 months. It is now 2 months and 3 days since the last menstruation. Morning nausea has been noted for the past month. The outline of the proximal surface (Fig. 3) of the uterus is observed to extend rather high in the pelvis, reaching above the line of the sacral promontory as observed in the fluorescent screen with bimanual vaginal examination. Comparing this uterine outline with others in the illustration, shows the increased size very conclusively. To the left of the margin of the uterus the circular, dense, and enlarged left ovary shows distinctly. Palpation shows this ovary to be free from fixation and only slightly tender to palpation.

Case 4. No. 3366. Miss W. Cardinal symptoms, diffuse abdominal tenderness, vomiting several times daily, occasional periods of nausea, loss of weight, sensation of distention with gas in the stomach, etc.

Diagnosis from history and clinical findings did not seem rational. After the X-ray findings were reported, the diagnosis of adhesions between the abdominal viscera and the anterior abdominal wall seemed satisfactory.

Illustration (Fig. 4) is offered as showing negative genital organs.

Observations at the time of operation coincided with the conclusion drawn from the X-ray findings. The outline of the proximal surface of the uterus is detected without difficulty as it overlays the lower portion of the sacrum.

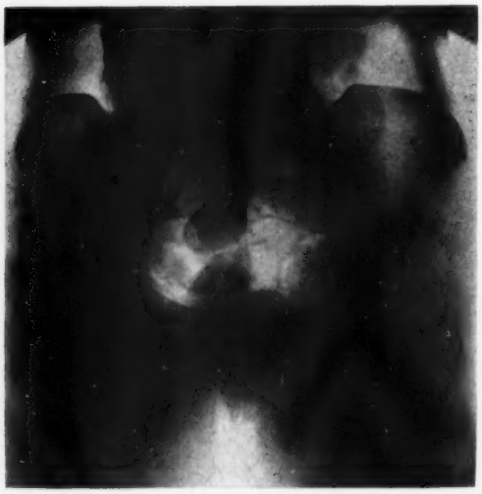

Fig. 5.

Fig. 6.

The outline is quite regular, but it appears to be broken, unless the left ovary is noticed, which overlays the left margin and somewhat the summit of the uterus. The round ligament appears as a dense narrow shadow extending from the left margin of the uterus. Crossing the shadow of the round ligament near the margin of the uterus the oviduct shows as a very faint shadow.

CASE 5. No. 3347. Miss M. Cardinal symptoms are pain in the abdomen relating principally to the right iliac fossa and epigastrium, also dysmenorrhœa for many years. Recurring periods of nervous phenomena somewhat hysterical in character. Loss of weight and strength. There is constant tenderness in the right iliac region. Diagnosis, chronic appendicitis.

Figure 5 shows the findings. The uterus gives a shadow above the line of the pubic bones which is somewhat to the right of the median line. It is noted that the upper surface of the body of the uterus is abnormal in shape. The left ovary appears just above the shadow of the uterus and also somewhat to the right of the median line. It appears more dense than a normal ovary. It is also possible to discern variation of density which is accounted for by its cystic nature as shown on section following resection. The right ovary appears as a shadow on the right of the uterus and situated slightly above it to the right and slightly below the left ovary. It is less dense than the right ovary, and appears about normal in position, size and density. It was noted in the fluorescent screen and by bimanual vaginal examination that both ovaries are fixed and somewhat tender when palpated.

The findings at operation showed the left oviduct had been removed, and there were peritoneal adhesions fixing the left ovary in the position indicated in the illustration. The right ovary seemed somewhat sclerotic and was also fixed in the position indicated.

CASE 6. No. 3369. Mrs. M'C. Cardinal symptoms are pain in the back, lumbar region, also in the abdomen, concentrating more particularly in the epigastrium and not exaggerated by eating; also dysmenorrhagia, dysuria, and painful defæcation probably dependent upon the presence of hæmorrhoids. Anorrhexia, myasthenia, irritating vaginal discharge, periodical pyrexia, and a history of loss of weight.

The diagnosis is chronic pyosalpinx with probably some endometritis and urethritis.

Figure 6 shows some of the X-ray findings. The dense circular shadow above the symphysis is the proximal surface of the border of the corpus uteri. Note that the uterus lies on the right of the median line. The dense narrow lines showing plainly on the left of the uterus is the round ligament. To the left of the round ligament the oviduct is observed to extend from the shadow of the uterus across the shadow of the round ligament and further to the left where it is overlapped by the shadow of the ovary. The fluorescent screen findings in conjunction with bimanual vaginal examination, indicate fixation between ovary and oviduct, which was verified at operation. The oviduct gives a shadow of less density than the round ligament. The density of the ovary is approximately that of the oviduct and uterus. On the right side the shadows of the ovary and oviduct are overlaid and confused by the shadows of the pelvic bones.

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GAS CYSTS OF THE INTESTINE[1]

Report of a Case

By HARRY G. SLOAN, M.D., Cleveland

THE first human case of gas cysts of the intestine or intestinal pneumatosis, as the condition has been designated by Turnure[2] was reported in 1876 by Bary, although since 1825 when its occurrence in an otherwise healthy pig was reported by Mayer, eight different writers have reported the occurrence of gas cysts in animals and have offered various theories regarding their etiology. Since Bary's case in 1876, 50 human cases have been reported in the literature, only two of which were in this country—one reported by Finney in 1908,[3] and Turnure's case reported in the article referred to above. In addition to these the author knows of an unreported case of Hamann. The last case to be reported is one of Tuffier's.[4]

On account of the apparent rarity of the occurrence, and the consequent lack of knowledge regarding the etiology and progress of these formations the author offers the following report:

The patient, a butler, age 32, gave a history of digestive irregularities—pain after meals and vomiting—for 15 years. During the preceding 2 months, the condition had been more active; he had been unable to retain any food, even if liquid, and had lost 30 pounds in weight. He had not vomited blood nor passed any blood in the fæces; the preceding week pain in the abdomen had become constant. The patient presented an emaciated, dehydrated appearance. His features were sunken. In the scaphoid abdomen peristaltic waves were apparent; his abdomen felt "doughy."

The fluoroscopic examination by Drs. Hill and Thomas gave evidence of obstruction at the pyloric end of the stomach. During the examination, Dr. Hill noticed an absence of the liver shadow, and therefore took a plate of the upper abdominal region to determine the exact nature of this anomaly. The picture herewith reproduced is the result. Dr. Hill tells us that in his personal observation of more than 15,000 abdominal plates he never has seen anything similar to this.

As shown by the photograph the liver shadow is replaced by a mottled appearing area showing the outline characteristic of the small intestine (Fig. 1). The autopsy finding of an unusually broad mesentery attached to this area of gut suggests that the mass of the small intestine was floated up into this position by the gas-containing cysts attached to it. The liver shadow can be made out 8 centimeters below the diaphragm, which is normal in appearance. As far as the author can discover, aside from the crepitus on palpation recorded by some observers, such a picture as this would be the only means of making a diagnosis before operation.

The patient was sent to Lakeside Hospital for hydration treatment preparatory to operation, which it was expected would be performed several days later.

On the same afternoon he experienced a sudden sharp abdominal pain. Examination showed absence of liver dullness, more tone in the right rectus muscle than in the left, with tenderness of the right rectal vault giving evidence of a perforation. Leu-

Fig. 1. Roentgenogram showing displacement of liver by floating-up of the small intestine.

[2] Ann. Surg., lvii, 811.
[3] J. Am. M. Ass., 1908, October 17, p. 1291.
[4] Bull. Acad. de méd.

[1] In part from the Department of Pathology, Lakeside Hospital.

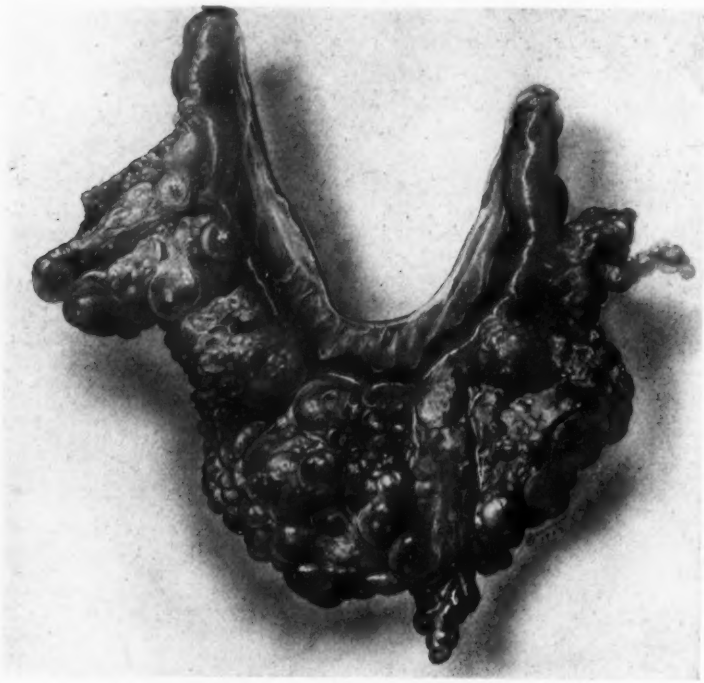
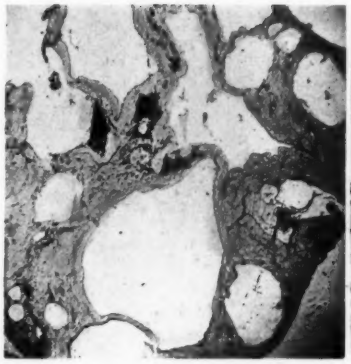


Fig. 2. Section of small intestine 30 centimeters above ileocæcal valve.

cocytes 15,000; rectal temperature 99.4°; pulse 132; respiration 24. Thus much against our wish, in spite of his low alkaline reserve, immediate operation became imperative. During the operation the patient gave every evidence of acidosis—rapid, shallow respiration and pale gray color. A saline infusion was given on the table. The operation was performed under complete anociation. On opening the peritoneum, gas and stomach contents escaped. The small intestine in its lower extent showed a most bizarre picture. Opposite the mesenteric attachment, there were multiple gas-containing cysts, whose walls were as thin as soap bubbles. In some areas they were matted together, sessile, 3 millimeters to 1 centimeter in diameter, over an extent of 10 to 15 centimeters (Fig. 2). Then again there were a few centimeters of intestine which showed here and there a single pedunculated vesicle hanging like a grape on its stem. In some places we saw white linear scars encircling the free border of the intestine, occupying the position of the subperitoneal intestinal lymphatic vessels where apparently spontaneous disappearance of the cysts had occurred. There was no acute inflammatory reaction in the cysts. The walls with their thin tracery of blood vessels were translucent, and only at the point where the cysts joined the pedicle, was there an opaque mother of pearl area, equal to about one-fifteenth of a cross section of the cyst. The mesenteric glands were soft and twice their normal size.

We found an old prepyloric ulcer completely obstructing the pyloric lumen, which was perforated in its anterior aspect. The stomach was extremely enlarged in size and its walls were thickened. The perforated ulcer was closed and a gastro-enterostomy was done. On account of the extremely reduced condition of the patient, a transfusion of 650 cubic centimeters of blood was given at once. The patient was put in the Fowler position, soda bicarbonate and glucose were given by rectal tap, an intravenous infusion of soda bicarbonate was given, morphine was administered in 1/6 grain doses to hold the respiration to from 12 to 16 per minute and thus conserve still further the failing reserves, and hot packs were applied. Anuria developed 6 hours after operation and death occurred the next day.

Although our prime motive in reporting this case is to note the anomalous condition described in the operative findings, it may not be out of place to insert a comment to the effect that had not the perforation forced



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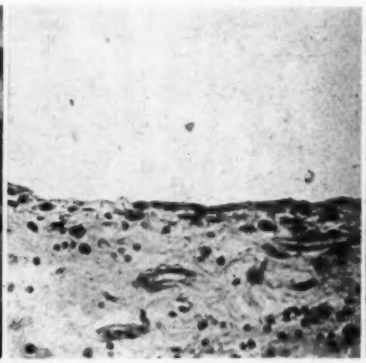

Fig. 4.

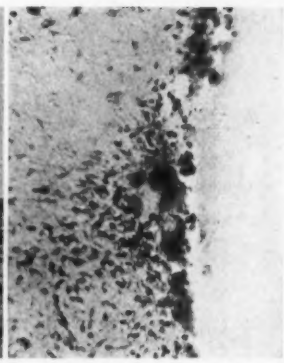

Fig. 5.

Fig. 3. Photomicrograph showing cysts in wall of ileum (x 7.5).

Fig. 4. Lining edothelium of cysts in ileum (x 675).

Fig. 5. Photomicrograph showing multinucleated cells in cyst wall in ileum (x 65).

our hand, operation upon this patient would have been deferred until, by forcing water and alkalies by rectal tap and subcutaneously, the acid-alkali balance had been restored, and the normal amount of fluid introduced into the tissues. Then the gastro-enterostomy could have been performed with a minimum of danger.

This case exemplifies the danger of allowing ourselves to forget the extreme risk of starved patients. Such cases all have a very low alkaline reserve and cannot tolerate surgical procedures until they have received fluids, glucose, and soda bicarbonate in large amounts. This patient had been slowly starving for 15 years; in addition he had continued to work up to the last moment although he was practically incapacitated by inanition.

PATHOLOGICAL REPORT

The author is indebted to Dr. Crump, assistant pathologist at Lakeside Hospital, for the following autopsy report, and to Dr. H. T. Karsner, professor of pathology, Western Reserve University, for the analysis and discussion of the histologic findings.

Autopsy findings (Dr. Crump). In the free margin of the small intestine about 20 centimeters from the ileocæcal junction of the small intestine and extending up the intestine for 60 centimeters are large numbers of air-containing cysts, with no communication between the lumen of the intestines and the cyst. The mesentery in this portion of the intestine is very loose. The cyst walls are transparent, have the appearance of peritoneum, and are very vascular. The stomach has an hour-glass appearance and is about twice its normal size. The walls are greatly thickened. In the region of the pylorus is a large ulcer which is surgically sewed and has perforated, producing a local acute peritonitis. There is present a chronic hypertrophic gastritis. Three rather large fungating ulcers are found in the pyloric region with indurated borders. The mass of scar tissue has so encroached upon the lumen of the pylorus that it is difficult to pass a probe from the stomach to the intestine. The gastro-enteric tract is otherwise negative.

In addition to these gastro-intestinal findings, there are present dilatation of the heart, passive congestion and œdema of lungs with bronchopneumonia, acute splenic hyperplasia, and passive congestion and cloudy swelling of the liver and kidneys, the latter superimposed on a slight chronic interstitial nephritis.

Histologic findings (Dr. Karsner). The microscopic sections from the ileum show in the subperitoneal coat numerous cystic areas apparently multilocular in character. The connective tissue between the cysts is increased in amount but variable as to character. For the most part it is not dense and resembles that of late granulation tissue rather than old adult tissue. In relation to some of the cysts are masses of young granulation tissue with fibroblasts in various stages of development and new capillaries. Several areas of extravasation of red blood cells are found, not especially in relation to new granulation. A moderate number of leucocytes infiltrate the tissue particularly near and in the fresh granulation. Near the peritoneal surface there is a small amount of fibrinous exudate communicating with a recent acute fibrinous peritonitis. The cysts vary in size up to 8 millimeters in diameter.

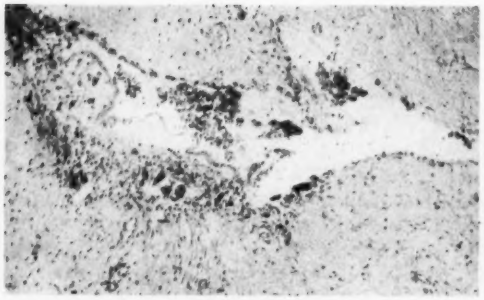

Fig. 6. Photomicrograph showing early granulation and partial obliteration of cyst in ileum (x 65).

Most of these are smooth walled, lined with a single layer of endothelium and contain a finely granular acidophilic precipitate evidently from a small amount of albuminous fluid within the cysts. Numerous cysts also show multinucleated cells continuous with the lining layer; they contain from two to a dozen nuclei resembling those of the endothelium. In certain areas the lining has almost disappeared, the cyst being small and of irregular outline and surrounded by fresh granulation tissue with giant cells toward the small cyst lumen. In a few cases the granulation tissue is older and projects into the cysts in the form of a bulb.

The muscular coats of the gut show no cysts nor do the submucous and mucous coats. There is a chronic catarrhal inflammation of the mucosa of moderate degree.

The ulcer situated at the pylorus is of chronic type with complete erosion extending into the submucosa and surrounded by dense connective tissue. In the subserosa there are 2 cysts visible to the naked eye, 1 millimeter and 3 millimeters in diameter. The smaller one shows a lining of endothelium and is partly obliterated by a bulb-like mass of old granulation extending into it similar to those in the ileum. The larger one shows no lining but is bordered by numerous multinucleated cells and an area of fairly old granulation tissue.

No bacteria are found in the histologic examination of these cystic areas.

The most important change in the heart is a marked chronic interstitial myocarditis. The lungs show marked passive congestion, œdema and a hypostatic bronchopneumonia. There is also a small tuberculous scar. The liver shows marked passive congestion, slight central hæmosiderosis and perilobular fibrosis. The spleen is the seat of marked passive congestion, slight fibrosis, and slight central arteriole hyalinization. The kidney exhibits a chronic interstitial nephritis of moderate degree, associated with marked cloudy swelling of the tubular epithelium and marked passive congestion. The adrenal shows marked passive congestion. The aorta shows moderate irregular intimal fibrosis but no change in media or adventitia.

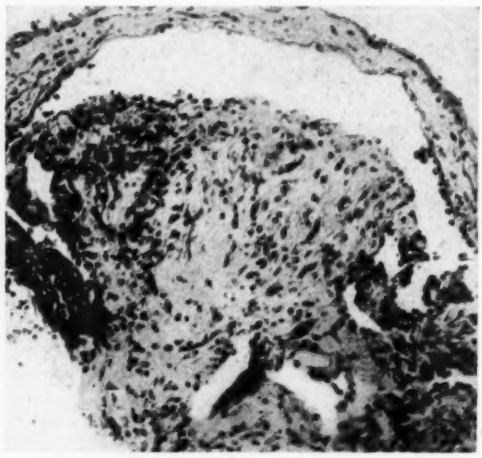

Fig. 7. Photomicrograph showing bulb-like mass of granulation partly obliterating cyst in ileum (x 145).

The pathologic examination would indicate that the condition is essentially a subacute or chronic interstitial emphysema of the gut. The tissue reaction is undoubtedly inflammatory in this case but of a subacute or subchronic nature as indicated by the relatively small number of polymorphonuclear leucocytes found. The multinucleated or "giant" cells are apparently the product of the lining cells of the cysts, show none of the characters of foreign body giant cells with inclusion bodies and are neither in morphology or distribution similar to those seen in tumors. They appear to be somewhat more resistant to destructive agents than the single lining cells as indicated by their survival in the earlier stages of granulation. Whether the inflammatory reaction is due to the presence of the gas or due to the presence of bacteria is questionable, but it is reasonable to expect that if bacteria were responsible they would be present in fairly large numbers. Bacteria are not found in the sections and it seems reasonable to assume that the gas in the cysts served as an irritant, thus leading to the inflammatory reaction. The origin of the gas must be either within the tissue spaces or from without. No analogy is known to support the assumption that the subperitoneal tissue produces gas in free form, nor is there any analogy to support the assumption that a tumor may produce free gas. Production of gas in tissues as a result of putrefaction is accompanied by the presence of bacteria in considerable numbers and the gas-forming bacteria of wound infections are active only in the presence of some necrosis and even under these circumstances the tissues show a considerable number of organisms. This argument leaves open for discussion the hypothesis that the gas is introduced from without. An opening for such introduction of gas exists in this

Fig. 8.

Fig. 9.

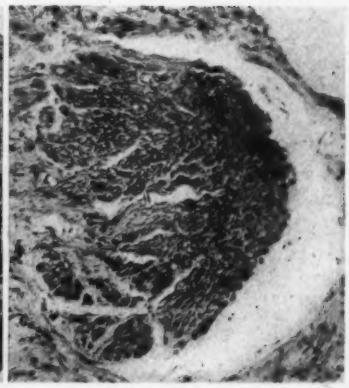

Fig. 10.

Fig. 8. Photomicrograph showing wall of stomach under gastric ulcer; at *A* a partly obliterated cyst and at *B* a cyst in the stage of early organization (x 7.5).

Fig. 9. Photomicrograph showing early granulation and multinucleated cells in wall of larger cyst in stomach wall shown at *B* in Fig. 8 (x 65).

Fig. 10. Bulb-like mass of old granulation tissue partly obliterating cyst in stomach wall shown at *A* in Fig. 8 (x110).

case in the gastric ulcer. Entering at such a point probably under the pressure influence of gastric muscular contraction on a volume of gas, the mode of transit to the ileum can best be explained by peristaltic action. Supporting this idea is the finding of old, more or less cicatrized, cysts in the subserosa of the stomach and more recent cysts with little inflammatory change in the lower small intestine, although in this latter situation there are also older cysts. Progress would be by paths of least resistance, namely through tissue spaces and lymphatics. Even were tissue spaces enlarged by bubbles of gas they would soon become lined with endothelium and become indistinguishable from larger lymphatic vessels. Independently of accompanying infection the gas could act as a foreign body and lead to the inflammatory reaction seen in the specimens. The subchronic nature of the inflammation leads to the view that the reaction is that of the tissues to the presence of the gas rather than that induced by bacterial infection.

ETIOLOGY

In addition to the above discussion, Dr. Karsner contributes the following regarding the etiology of gas cysts of the intestine.

There are three theories of etiology: mechanical, bacterial and neoplastic.

The neoplastic theory was suggested by Bang and has against it the frequent spontaneous disappearance of the cysts with cicatrization. MacCallum, in Finney's case, suggests that certain vacuolated cells might give origin to the gas. Had his studies shown that the material in the vacuolated cells was gas and not the more usual substances found in vacuolated cells his proposition might be more convincing. Definitely against such an assumption is the absence of description of such cells in many other reports and a complete failure to find them in our case. Kouskow's idea that the giant cells are specific formers of gas is opposed by the fact that the larger cysts show no giant cells and the giant cells are most numerous in the cysts which are reduced in gas content.

The bacterial theory is opposed by the numerous instances in which anaerobic and aerobic cultures have been negative. Furthermore, the wide variations in types of bacteria formed suggest contamination of intestinal origin.

Tuffier opposes the mechanical theory on the basis of the fact that certain cases failed to show a point of entry for the gas. On the other hand a large majority of the reported cases have shown a possible point of entry, via a gastric ulcer or a tuberculous one. Knowing how fine a needle puncture may lead to interstitial emphysema of the chest wall and how small a lesion of the lung may lead to interstitial emphysema, it is easily within reason to consider that those cases of gas cyst failing to show gross lesion might have had their origin in a lesion small enough to escape the notice of the surgeon or pathologist.

The analyses of the gas so far published are contradictory and incomplete. The gas found by Jager with high hydrogen concentration might be intestinal gas, that of Luiz might be air and that of Urban is extremely incomplete. Perhaps all these investigators worked with too small amounts of gas to permit of satisfactory and complete analyses.

CONCLUSION

The etiology of the case reported above is best explained on the mechanical theory.

RHINOPHYMA [1]

By M. G. SEELIG, M.D., F.A.C.S., St. Louis

RHINOPHYMA is an essential disease of the nose, of more than ordinary interest. The gross characteristics of the disease and the resultant disfigurement are, in the first instance, striking. From the purely clinical side, the uncertain and possible multiplicity of etiological factors adds interest. From the pathological side there is presented the interesting problem of deciding whether to classify the disease as an inflammatory hypertrophy or as a frank neoplasm, and finally, from the historical point of view, the disease simulates unusual and fascinating interest, owing to the part played by the old masters of classical painting and satire in picturing the disease on canvas and in prints.

From the clinical side, rhinophyma might be described fairly accurately if one merely set down the various descriptive terms which have been used in naming the disease: whiskey nose, pound nose, nodular nose, growing nose, copper nose, elephantiasis of the nose, hypertrophy of the nose, lymphangioma, acne hyperplastica, fibroma molluscum and cyst-adeno-fibroma. In the earliest stage of the disease the nose is a dark copper red, and there are dark red spots about it, particularly on the cheeks and at the glabella. Gradually there appear on the nose lentil-size to pea-size discrete or confluent nodules. As these nodules coalesce, and the soft parts hypertrophy, the whole organ becomes deformed by the tumor-like nodules. The deforming growths occur usually at the tip and on both alæ, and may be discrete and lobulated, or they may fuse, forming one large knob. Sometimes they are pedunculated. Von Bruns reports a case in which the growth reached to the chin, and had to be held aside when the patient partook of food or drink. As a rule there are only three irregularly rounded lobulated growths situated at tip and alæ but sometimes there are many small lobes separated by deep furrows. The nodules are usually soft and are coursed by dilated veins, and studded with comedoes and acne pustules. Owing to the activity of the sebaceous glands, the surface of the nose presents an oily varnished appearance, and seems to be pitted by the wide open mouths of these glands. Pressure on the nodules causes macaroni-like plugs of sebum to worm out from the sebaceous glands.

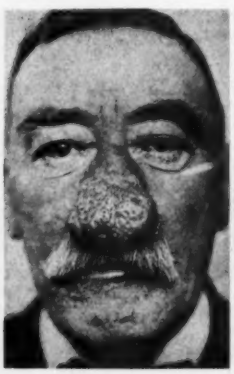

Fig. 1.

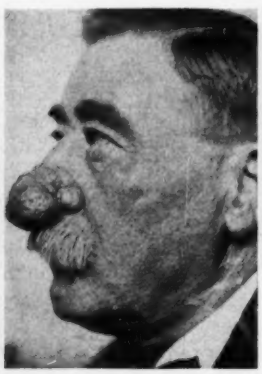

Fig. 2.

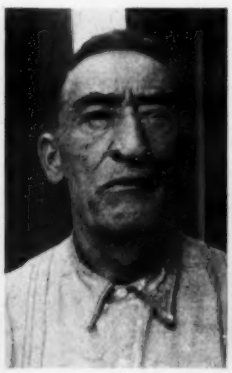

Fig. 3.

Fig. 4.

Fig. 1. Rhinophyma before operation.
Fig. 2. Profile, same patient.
Fig. 3. Same patient after operation.
Fig. 4. Profile, same patient after operation.

[1] Read at the meeting of the Western Surgical Association, Kansas City, December, 1919

Fig. 5.

Fig. 6.

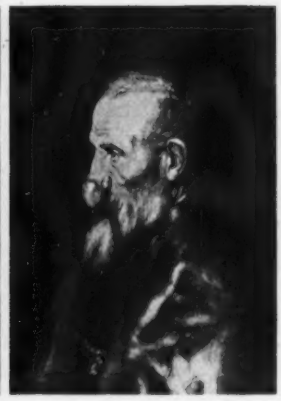

Fig. 7.

Fig. 5. Unknown subject, painted by Holbein the younger (1497-1553). Hangs in the Prado of Madrid. (From *Hollaender*.)

Fig. 6. Portrait of supposed grandfather and grandchild by Ghirlandajo (1449-1494). Hangs in the Louvre. (From *Hollaender*.)

Fig. 7. Unknown sitter by a Holland master, in Museum at Stockholm. (From *Hollaender*.)

The disease occurs usually in the fifth and sixth decades, that is, the deformity is complete at these periods, the process having taken five to twenty years to develop fully.

There probably is no relationship between the disease and alcoholism. An analysis of the cases shows that there is an infinitesimally small number, compared with the number of alcoholics; and that many cases of rhinophyma occur in non-drinkers.

The commonly accepted opinion is that rhinophyma, pathologically speaking, repre sents the terminal stage of acne rosacea that has passed through acne hypertrophica. In many instances the disease seems to rest on a congenital basis; Lassar believed that there was a predisposition to rhinophyma in wide-pored individuals. The essential pathological process is an hyperplasia of the connective tissue of the soft parts of the nose, accompanied by a dilatation of the blood vessels, and hypertrophy or cystic degeneration of the sebaceous glands. The skin follicles show, in places, distinct evidences of suppuration. The openings of follicles and of the ducts of the sebaceous glands are widened, so that they resemble deeply-pitted pores, often giving to the nose the appearance of a sponge. No one has ever satisfactorily demonstrated the cause of the disease. Kaposi sought to prove that the connective-tissue growth, blood-vessel dilatation, and sebaceous-gland degeneration, were all secondary to an angioneurosis; but there is no marked consensus of opinion concerning this theory. Trendelenburg considered the disease as a new-growth and grouped it under the head of fibroma molluscum; Lassar considered it a cysto-adeno-fibroma.

I am indebted to Dr. Martin Engman for the privilege of quoting from the advance sheets of his forthcoming book on *Diseases of the Skin*. Dr. Engman, from an intensive study of rhinophyma, draws the following conclusions regarding the pathology of the disease. "Rhinophyma is a familial disease representing some type of hereditary transmission. It occurs usually in the seborrhœic type of individual. (The seborrhœic type of Sabouraud may be described as an individual with yellowish-tinted, muddy, thick skin, the yellowish tint being most pronounced around seborrhœic areas, with a tendency to acne vulgaris in youth and acne rosacea in middle life.) The future rhinophyma subject shows a tendency toward flushing of the face, on entering a warm room, after meals, or under excitement. This flushing leads, in time, to a chronic congestion, with secondary chronic infection of the skin of the nose and

Fig. 8.

Der grossächtige / dickprächtige / langnasichtende / menschmachende
Nasen Monarch:
Mit seiner hochansehnlichen / treubestallten nasenlosen nidergehorsamen
Grossen Nasen

Fig. 9.

Fig. 10.

Fig. 8. Print of Gerhard Janssen, an old glass etcher of the middle 17th Century. (From *Hollaender.*)

Fig. 9. A caricature from the 17th century. One of the so-called Kings of Noses. (From *Hollaender.*)

Fig. 10. A caricature of a physician, published about 1700 in Augsburg. (See text for translation of legend.) (From *Hollaender.*)

sometimes of the cheeks. This in turn leads to a chronic productive inflammation, with vascular dilation, connective-tissue formation, and dilation of the sebaceous glands into cyst formations. There is a marked thickening of the cutis vera, which throws the skin into folds and furrows. The end-result is the multiple formation of knobs or tumor-like masses."

The treatment of the disease is exclusively operative. The occasional recommendation to practice wedge-shaped excisions, should be ignored. The most satisfactory operative procedure consists in shaving off the redundant tissue until the nose is brought back to what one assumes was its original form. In this shaving process, two things should be borne carefully in mind: (1) do not shave too deeply, and (2) preserve a thin rim of epithelium around the nares. If the shaving is carried too deeply, we remove all sebaceous-gland rests and leave no niduses of epithelium from which, as brood centers, epithelization may spread. This delays healing, and even if the nose be grafted, the resultant skin has a harsh, white, dry appearance so striking as always to command attention and cause comment. Furthermore deep shaving may injure the nasal cartilages and set up a stub-born perichondritis. If a thin ring of intact skin is not left around the nares, serious disfigurement may result from the contractions incident to cicatrization. Hæmorrhage, which is usually very free, is checked with comparative ease by simple gauze pressure, and the patient is sent to bed with a large, well vaselined gauze pad over his nose. The next day this pad is removed, and the denuded area is strapped with imbricated strips of sterile zinc oxide adhesive plaster. This plaster dressing is changed daily. Under this simple dressing, my patient, shown in Figures 1 to 4, was completely healed in ten days. It is not necessary to skin graft these patients. Indeed von Bruns points out that grafting often leads to the development of retention cysts underneath the grafts, with subsequent breaking through and ulceration.

The rôle that rhinophyma plays in medical history and in classical medical art and caricature is not totally without interest even to a group of practical surgeons. Dr. Eugen Hollaender in his two volumes devoted to *Medicine in Classical Art*, and *Caricature and Satire in Medicine* furnishes some striking copies of pictures that feature rhinophyma.

Hans Holbein, 1497-1553 (known as Holbein the younger) famous in medical art as

the painter of the Dance of Death, painted the portrait of an unknown subject (Fig. 5). The portrait, which hangs in the Prado at Madrid, shows an old man, with a typical rhinophyma, and the characteristic red, congested color scheme which goes with this disease. Hollaender states that the coloring seems to have been toned down by the artist, in order to minimize the existence of the disease as much as possible.

Domenico Ghirlandajo, 1449-1494, the famous Florentine artist, has a picture in the Louvre illustrating rhinophyma even more typically (Fig. 6). Hollaender's speculations on this particular picture are interesting rather than convincing. He queries as to whether the small tumor on the right brow of the old gentleman may not be intended as a metastasis, thus hinting at the possible belief that rhinophyma was at that time considered to be malignant. Then further, he speculates as to whether the beautiful child's head was intended to soften, by contrast, the jarring asymmetry of the bulbous nose of the old gentleman, or whether the perfect featured little granddaughter was used to disprove the familial nature of the disease.

Hollaender presents these two pictures (Figs. 5 and 6) and the picture by an unknown Holland master (in the museum at Stockholm, Fig. 7) to illustrate the fact that they are pure portraiture, artistically executed without a semblance of caricature. These portraits may stimulate a sense of sympathy but they make no appeal whatsoever to the risible in our make-up.

By contrast, Figure 8 leads away from art, into the field of caricature. This old rhinophyma subject, Gerhard Janssen by name, was a master glass etcher, born in Holland and trained in his art at Dresden, 1650-54. The print itself is not a caricature, but the descriptive phrases engraved about it[1] furnish

[1] The legend about the frame is as follows:
A misshapen nose indeed, but a man of talent and wisdom. Art, work, and industry bring praise and reward.
The legend underneath the picture is:
Herr Gerhard Janssen, former court glass painter, and also experienced in the Damascan art of glass etching. Born in Utrecht, Holland, 1636, July 21; studied at Vreden in Westphalia, from 1650 to 1654. Removed to Vienna in 1662 where he died in 1725. June 3, at the age of eighty-eight years, ten months and eight days. God rest his soul. This print drawn and etched July 25, 1725 by U. D. Metager, learned in this art, from Speyer, in the Palitinate but at this time residing in Maria Hof, fifteen minutes from Vienna.

Fig. 11. Chief Wa-Ha-Gun-Ta (American name is Capt. John Smith) of the Chippewas. Still living, and an active hunter in Glacier Park, at an approximate age of 127 years. Rhinophyma is fairly common in American Indians.

a caricaturish setting; such phrases, for example as the legend just above the head, *Nasutus sed acutus* (large nosed but wise) and the sentence in the frame, "*Es ist wahr ein unfoermliche Nase, aber sinnreicher Verstand* (a misshapen nose, 'tis true, but talented and wise).

The next two prints are frank caricatures. Figure 9 is from an old 17th century pamphlet and is a simon-pure bit of what Hollaender ca ls naive lack of humor of this period. This king of The Large Nosed stands surrounded by all sorts of impossible things, people, animals, a large horn, a mercury's staff, a shepherd's staff, ships, etc., and points proudly to his rhinophymistic organ.

Figure 10 is an even grosser caricature, and represents the tendency at this particular time (late 1600) to use the doctor as a scapegoat and harlequin in jokes and on the stage. This large-nosed doctor, with what might be

construed as a rhinophyma knob at the proximal and middle third of his proboscis proclaims:

"For healthy people, I am a doctor, God help the Sick.
My large head gear embraces profound and numerous thoughts.
My costume connotes the art that I possess.
What may be concealed in the urine, my long nose detects."

And finally, Figure 11 is not without interest from an ethnological point of view. Rhinophyma is fairly common in the American Indian. This is a portrait of Wa-Ha-Gun-Ta chief of the Chippewas (photographed by Mr. William Burton of St. Louis, who kindly loaned me this copy). There are authentic records to show that the chief is about 127 years old, and as far as the memory of man runs he has had a typical rhinophyma.

ABDOMINAL SURGERY IN THE CASUALTY CLEARING STATION AND EVACUATION HOSPITAL[1]

By WILLIAM M. THOMPSON, M.D., F.A.C.S., Chicago

IT is quite as important to bring the literature of war surgery up-to-date as it is to revise the manual of the medical corps. This has been done, but not in an organized manner as to the treatment of war wounds at the base and reconstruction hospitals. However, nothing has been done to collect and correlate the results of our experiences and knowledge of the primary surgery of the front that makes possible successful reconstruction work and has the largest influence in the weal or woe of the sufferer from war wounds.

If the surgeons of future wars are to profit by the wealth of our experience, it is our duty to set down what we know of methods that have given the best results as well as our ideas of any improvements that may be made in the evacuation of wounded and the technique of the surgery of war wounds.

The Civil War saw the beginning of laparotomy in the treatment of war wounds, but it was fraught with even more disastrous results than peace time laparotomy of that day. Because of this later development of surgical science, we have only the more recent wars to draw conclusions from, the war in the Transvaal, Chino-Japanese, Russo-Japanese, Cuban, and the World War of 1914–1918. It will be seen from a perusal of the statistics of these wars that the evolution of ideas of treatment of the wounded has not progressed steadily toward a definite formula of surgical attack but that opinion has fluctuated from one extreme to the other. (In a paper of this sort space forbids discussion of the Murphy operation or any of the other half way methods.) But gradually one notices at each successive forward wave a slight improvement in results as shown by statistics.

In a given surgical unit properly equipped, there are four reasons for this fluctuation: (1) the distance and mode of transportation from the battlefield to the surgeon; (2) the time elapsed before the wounded man is operated upon; (3) the type of missile; (4) the character of the wound.

Experience has proved that every hour is precious in dealing with an acute abdomen, for certainly we must class all war wounds as highly acute; also jolting over shell holes helps to distribute the contents of the intestinal canal rent by shell fragments. It must be borne in mind in comparing the damage by different missiles that high explosive shell fragments rank first, and that aerial bombs and hand grenades are classed along with high explosive. Next in order come bullets and last, shrapnel balls. The great war saw the introduction of high explosive bombs and grenades. Previous wars had only to contend with the other form of wounds, but the use of smokeless powder in this war has speeded the

[1] Read before the Chicago Genecological Society, December 19, 1910. (For discussion, see p. 417)

bullet up and made it more destructive to tissue and bone. One can be easily misled if one relies on bare statistics to form an opinion of the mortality of operated upon versus non-operated upon wounds.

In one series from French reports where non-operative interference was practiced there were 713 cases, with 550 deaths and 163 recoveries, the mortality being 72.2 per cent. Of those subjected to laparotomy, in a series of 688 cases there were 249 recoveries, or 36 per cent; and 439 deaths, or 64 per cent. Of this series there were 251 cases of lesions of the small intestine, with 75 recoveries, or 70 per cent mortality. But these figures are open to the following criticism: (1) the unknown number who died before reaching the operating station. (2) Those whose wounds did not penetrate the peritoneal cavity in the non-operated upon series might easily be mistaken for penetrating; for example, working in conjunction with a French ambulance in the battle at Chateau Thierry, a French officer refused to operate upon an abdomen on the ground that it was penetrating and inoperable. I differed with him, and he said go ahead, so we changed tables. I found the wound non-penetrating, partly girdling the right side just external to the peritoneum but destroying much muscle. The man recovered. (3) Visceral lesions, as for instance, those of the liver when made by bullet or small shell fragments seldom need operation. I had 12 cases of entrance and exit liver wounds in my wards at one time that recovered without surgical treatment. (4) Deferred laparotomies, usually operated upon at the base when the lesion becomes localized and can then be treated by the stab wound and drainage method. (5) Entrance and exit wounds of the outer border of ascending and descending colon with sufficient drainage.

Thus it will be seen that certain cases do recover when not operated upon, but we still have a large percentage of those with perforation of the small intestine, stomach, transverse colon, rectum, gall-bladder, and in addition those suffering from internal hæmorrhages who are doomed without operation. This class of cases only serves to emphasize the necessity for a careful *triage* or sorting of all wounded at the dressing station. These patients and those with compound fractures of the femur and with chest wounds, as well as those with thoraco-abdominal wounds, should be collected and sent directly to operating stations equipped for such cases. When an abdominal case comes in, it is better not to wait until there are enough cases to fill the ambulance, but send it on at once, as hours are precious.

In addition to the four causes of failure in laparotomies in previous wars, in this war, there has been an additional cause, the bombing of hospitals by night. It has been my observation that nothing in an advanced hospital adds more to the shock already suffered by these patients than serious night bombing.

In our earlier wars and frequently in the great war, laparotomy often disappointed the hopes of the most favorably inclined surgeons but, on the other hand, a careful analysis of statistics demonstrates the success of non-interference to be much rarer than had been thought.

In my experience in this war, I have observed three periods that have largely influenced the statistics of laparotomy. The first period was in 1917 when trench fighting attacks and counter-attacks were common, but there was no great fluctuation of the lines. During this sort of fighting more favorable results followed laparotomy because the casualty clearing station could be better situated, was moved less frequently and better surroundings and equipment could be had, as it was not necessary to be ready to move on short notice. The second was the period of retreat, during the spring of 1918. During this time results from laparotomy were unfavorable. The organizations sometimes lost much of their equipment and had of necessity to evacuate many cases that might have been saved if there had been time to operate and if there had been a place of comparative safety for the patients to convalesce before evacuation. In the first period, a rail head was always at hand by which in 24 hours after operation we evacuated nearly all the cases comfortably. In the second period, rail heads, if they were at hand, were choked with

all sorts of combatants and material, and, at other times they had been put out of use so that resort to ambulance transport was the only means of evacuation, a painful process, adding to the mortality. In the third period of rapid advance, the hospitals were unable to keep up with the army, necessitating long transport and delay; and this was unfavorable to the best results in abdominal wounds.

It is agreed that the treatment of selected abdominal wounds is laparotomy. Let us next consider the conditions and surroundings necessary for success. As I stated in a previous paragraph, the cases must be selected at the dressing station. The work must be done by a surgeon of large experience and sound judgment. Too much emphasis cannot be laid on the necessity of selecting such a man. Other wounds, as of the head and extremities, except of femurs, can wait if hæmorrhage is controlled and splints applied until a sufficient number has accumulated to fill an ambulance, but sucking chest wounds, abdominal wounds and injuries of the femur should be given the preference in transportation. The *triage* officer should classify his abdominal lesions about as follows:

1. A certain number cannot recover under any conditions. These should be set to one side and given morphine to make their last hours as comfortable as possible.

2. Abdomino-thoracic lesions are usually extremely serious unless traversing the lower thorax and involving only the diaphragm and liver. The serious ones should be immediately evacuated if they can make the trip safely.

3. Multivisceral wounds of the abdomen are more serious and should be evacuated rapidly.

4. A certain number of visceral lesions may recover spontaneously as has been mentioned before—entrance and exit wounds of the liver. These can usually be collected with other of the less serious cases and transported in bulk.

5. There are some visceral lesions that cannot possibly heal spontaneously and should be classed among those needing immediate transportation.

6. A certain number of penetrating wounds that do not affect any viscera, even when the abdomen is traversed from one side to the other, cannot be easily differentiated from the serious. They should be classed with the serious and immediately transported.

7. Those wounds that are plainly non-penetrating can be sent down with other wounds.

Now there are four classes out of seven that should be given preference in transportation, and this is usually possible except under circumstances when, so to speak, the bars are down and the flood of wounded pours in and the medical department appears to be swamped. This is the time when training and discipline, which are a part of preparedness, score high. Out of disorder begins to appear order and system. Every man knows his duty and does it; transport in all forms from trucks to ambulances having been previously arranged for come up and the field is gradually cleared.

The next stop is the field hospital. The ambulance corps which has charge of the dressing station and the transportation of the wounded from there to the field hospital has five medical officers, but experience has shown that most of the work done by them, that of commanding and supervising transportation, could be done by a layman, and at least two of the surgeons added to the staff of the field hospital. At times in this war it was necessary for a field hospital to assume the functions of an evacuation hospital. There was nearly always a dearth of surgeons and supplies when they were most needed.

It is my belief that in the majority of instances the field hospital is the point at which the four classes of abdominal wounds should be held and arrangements perfected for their surgical care. We have shown the importance of early operation and unless the evacuation hospital is close up, a loss of time ensues which may be fatal to many. This does not deprive the evacuation hospital of its position as the center of surgical activity of the advance, as in the plan I am about to outline only the non-transportables, as we may class those enumerated above, are held at the field hospital. This plan does not obliterate

the mobile unit but retains it in an even more mobile state to re-enforce evacuation hospitals on the eve of a heavy engagement.

There should be added to the commissioned personnel, one surgical team as part of the permanent staff of the field hospital which would be adequate for taking care of all non-transportables when the front is fairly quiet. All of you who have served in advance hospitals know the difficulties of securing transportation for surgical teams in times of stress. You also know that when a request for surgical teams goes in through channels—general headquarters—and from there an order goes out to the teams to move, because of the scarcity of motor transport, the teams have to take a circuitous rail route and that they often arrive after the battle is over and the work cleaned up. Let us then take a sufficient number of teams and put each of them on wheels consisting of one ambulance for baggage and personnel, the ambulance to be attached to the field hospital as long as the team remains for the transport of wounded; a motor truck which will carry a compact, full operating-room equipment, sterilizer, etc., also a small take-down portable room that is standardized.

Army regulations make a field hospital a divisional organization. This is all very well when a division is acting independently, but as part of an army corps, orders should come directly from corps headquarters, thus saving time, and when the division is at rest the hospital can still carry on, taking some of the work from other divisions that are in combat. All teams and hospitals should be directly under centralized authority in the zone of advance. The officer commanding should sit in his office and should receive frequent reports of the condition of each hospital. He should know how to anticipate a big push and be in direct communication with all his teams.

On reaching the field hospital the abdominal case again passes through the *triage*. As is natural, the most serious cases are examined first. From the notes on the label the *triage* officer ascertains the time of the wound and cause (missile). He looks for pain, vomiting, position of wound, stool and micturition. His examination should include an inspection of the point of entrance, and exit if there be any, of the missile; the contraction due to rigidity, whether general or local; examine the flanks for fluid. The facial expression is a help in making the diagnosis; also the color of the skin and mucous membranes; cold, clammy, or sweaty skin; dark circles around the eyes; cold extremities; dyspnœa or restlessness, and lastly, the pulse and temperature. I am not in favor of probing the wound.

These questions answered will usually enable the surgeon to determine whether the wounds are penetrating, and if penetrating, what important viscera are injured, and finally, if the case is operable. If pain, pallor, cold sweat, rapid thready pulse, anxiety, restlessness, suggest that in addition there is concealed hæmorrhage, then this case takes precedence over all others and should be rushed immediately to the operating theater without taking time for radioscopy, as the case is rapidly prepared for operation. Arrangements are made simultaneously to transfuse, using citrated blood from one of the gassed cases. If the surgeon is satisfied that there is no hæmorrhage, but that the symptoms manifested are those of what we call shock, then it may be best to send the patient to the shock ward, where heat is applied, hot drinks administered, and transfusion practiced. The patient is returned to the theater as soon as the shock team is satisfied that his condition will warrant an operation.

The relation between the shock ward and the surgical department should be so close that they dovetail into one another.

I have mentioned transfusion for shock, and I appreciate that it may sound unusual to civil surgeons, but in civil surgery we seldom see such severe degrees of shock as we do in war. Let me say to those who have never witnessed it, that a compounded fracture of the femur may cause the most severe shock. After my experience in watching the work of the shock teams in evacuation hospital No. 110, I would even go farther and transfuse, not only for hæmorrhage and shock but also for severe sepsis.

No attempt should be made to operate in the presence of severe shock. Finally, no surgeon should allow his feelings to dominate his judgment and pass cases that are clearly beyond surgical aid on to the operating room. He should consider that all the efforts of the surgeons are being used to save those who can be saved.

Passing through the X-ray to the operating room, we will consider the technique of laparotomy. This is such a large subject, that it would take at least a paper to do it justice, so I shall mention only a few of the important principles. The first is speed without hurrying by avoiding all false moves and fancy methods. Two sets of instruments are necessary, one to excise the damaged skin and muscle and clean the wounds, for we must make every effort to secure the best possible asepsis. The abdomen is usually opened at a point that will most easily permit the exploration to get at damaged viscera. The incision should be ample. Muscles should be cut across when necessary. Sources of infection are encountered, one from the dirt and clothing carried in by the projectile itself, the other from intestinal contents. The same rule that holds in civil surgery holds here regarding wounds of the lower intestinal tract, that they are more infectious. Bullet wounds are, as a rule, cleaner than high explosive wounds because of the ragged edges and rotation do the most damage. The liver will stand a good deal of surgery if no large vessels are injured. The spleen may be plugged if the hole is small; also the kidney, but if the wound is large and ragged, the organ must be removed.

Intestinal injuries from projectiles differ from abdominal infections of civil practice in that we are in the presence of fresh injuries. There are no adhesions, and peritonitis has not had time to interfere greatly with the nutrition of the gut, so that intestinal sutures that would not hold in civil surgery will often do remarkably well. For this reason one does not need to resect as frequently, and this is fortunate as it increases the mortality. End-to-end anastomosis is the rule. One of the greatest difficulties to handle is laceration of the splenic flexure of the large intestine and the hepatic flexure ranks next. Transverse wounds involving the diaphragm are easily sutured through openings in the thorax.

In thoraco-abdominal wounds, the thorax should be attacked first and closed before opening the abdomen. Many perforating wounds of the small intestine need only a circular suture. It is gratifying to see how well these wounds do even when the intestine is considerably reduced in caliber.

Closure should be with through-and-through sutures, either of wire or silkworm gut, care being taken to draw the peritoneum well into the wound. There is no debate on this procedure.

Drainage is always safest. The surgeon should content himself with doing just enough to save the patient, and not allow his enthusiasm to carry him into operative procedures requiring time and great skill when simple methods will do.

I have said nothing about searching for the foreign body purposely, because bringing up that question at this point serves to add emphasis. After inspecting the abdomen the injured intestines are clamped and surrounded by moist packs and the abdomen well cleansed. If the foreign body is found during this inspection, remove it; if not, do not waste time, but proceed with the operation. If the foreign body is where it will do serious harm, it is usually easily found. If not, it becomes encysted by omentum or inflammatory tissue later on.

Many of these patients should be returned to the shock ward where, as in all abdominal operations, the Fowler position and saline drip are routine.

I have passed over injuries of the urinary bladder, rectum, and pelvic bones. This is a large subject by itself, as is also the subject of abdominal wounds complicated by injuries to the spine.

DEPARTMENT OF TECHNIQUE

THE UTILIZATION OF THE TRANSPOSED UTERUS FOR THE CURE OF EXTENSIVE VESICOVAGINAL FISTULA

Report of Case

By CHARLES E. DOWMAN, A.B., M.D., F.A.C.S., Atlanta, Georgia

IN November, 1910, there was referred to me a woman, 26 years of age, who had the most extensive vesico-uterovaginal fistula which I had ever seen. Three months previous to my examination the patient had given birth to a full-term child. At this time she had been attended by a midwife who had allowed her to remain in labor for 6 days. A physician was then called and removed a dead child by means of forceps. Following this delivery the patient had a constant dripping of urine from the vagina, and no longer voided in the normal way. On examination I found the condition represented in illustrations 1 and 2. There had evidently been an extensive necrosis (due to the pressure of the child's head), of the anterior portion of the cervix and anterior vaginal wall, with complete destruction of almost the entire posterior wall of the bladder. This necrosis fortunately had not involved the ureters, but had extended down as far as the trigonum. The necrotic mass had sloughed away, leaving a clean-cut opening with smooth healed edges. In spite of this history and the condition found on examination, the patient's general health was good.

After considering the technical difficulties of closing such an extensive fistula, and with the full realization that whatever methods might be employed, the chances of success were very slight, I decided to operate; and the following method was adopted:

With the patient in the lithotomy position, an incision was made at the junction of the

Fig. 1.

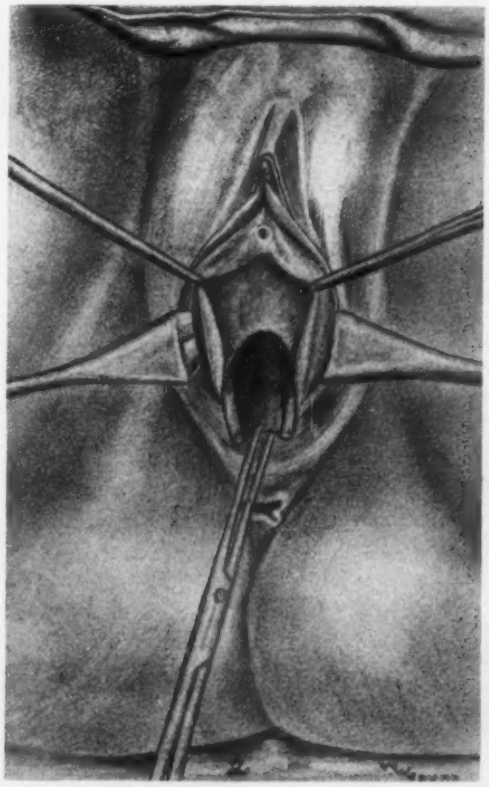

Fig. 2.

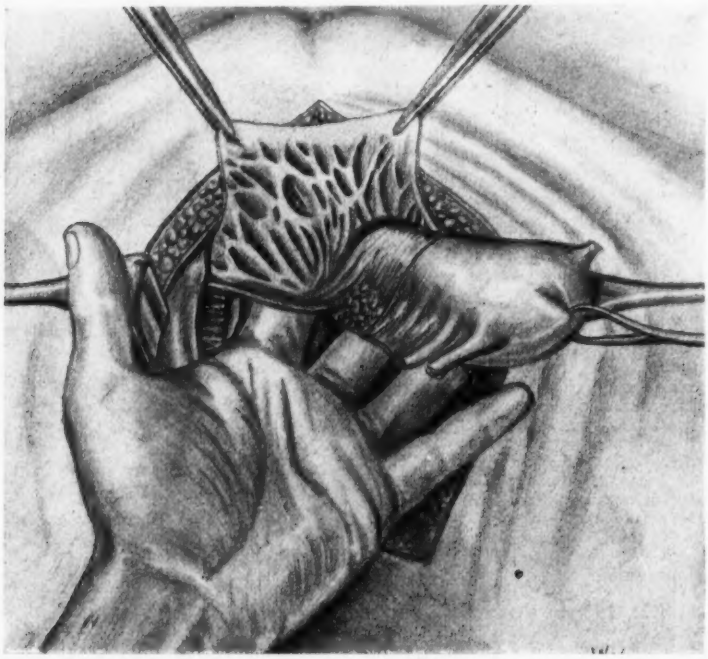

Fig. 3.

bladder and vaginal mucous membrane, and the bladder wall freed extensively from the anterior wall of the vagina, well out to either side and below toward the trigonum. The denuded areas were packed with gauze and the patient placed in the Trendelenburg position. The abdomen was opened by means of a mid-line incision and the pelvic organs exposed. The tubes, round ligaments, and broad ligaments were divided between ligatures on either side, and the bladder opened at its attachment to the anterior wall of the uterus. The dissection was continued until the bladder was completely freed of all uterine attachment. The uterus was placed in an extreme anteverted position so that the posterior wall of the fundus could be utilized as the posterior wall of the reconstructed bladder. That part of the bladder wall which was thus accessible through the abdominal opening was sutured to the posterior surface of the uterus, by means of chromic catgut sutures, in such a manner as to bring the mucous membrane of the bladder in contact with and approximated to the peritoneal covering of the uterus. These sutures were placed through the bladder wall but not through the bladder mucosa, so as to avoid any of the sutures being exposed in the bladder cavity. This line of sutures was re-enforced by a second layer of catgut sutures. The abdomen was closed and the patient again placed in the lithotomy

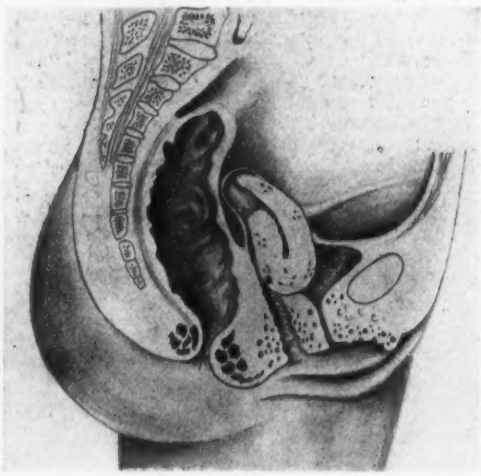

Fig. 4.

position. Through the vagina the operation was completed by continuing the approximation of the bladder wall to the peritoneal surface of the uterus by means of similar layers of sutures. Figures 3 and 4 show in a diagrammatic way how the above was accomplished. A retention catheter was placed in the urethra.

Following the removal of the catheter 6 days later the patient began to void normally and had no leakage of urine whatsoever from the vagina. Three weeks following the operation she was allowed to return home. Three months later the bladder was inspected through a Kelly cystoscope. The normal bladder and that part of the uterus which formed its posterior wall could hardly be differentiated. The patient was last seen 6 years later and seemed healthy in all respects. Her bladder had given her no further trouble.

Fortunately, such an extensive vesicovaginal fistula as existed in the above case is of very rare occurrence. During the nine years which have elapsed since operating upon this patient I have not seen a fistula so extensive as to necessitate utilizing the uterus in effecting a closure. In this particular case, however, I know of no other method of bladder reconstruction which could have given such a satisfactory result.

SKIN GRAFTING BY MEANS OF FREEZING WITH ETHYL CHLORIDE

By GASTON TORRANCE, M.D., Birmingham, Alabana

A NUMBER of years ago, while resident physician in The Old Pennsylvania Hospital in Philadelphia, I devised the following method of skin grafting and published a report of some cases.

Since that time I have used the method in a number of cases and have found it quite satisfactory in small areas in which there has been considerable destruction of tissue, as in deep burns or ulcers; patients with painful leg ulcers exposing a nerve, have experienced immediate relief.

The thigh is shaved and cleaned with ether and alcohol; and an area on the top of the thigh about the size of a silver dollar is frozen and is cut out with a sharp razor just within the frozen area going well down into the fatty layer. The grafts are applied immediately to the granulation surface and when they become "thawed out" they will be found to be firmly glued to the granulation surface. They very rarely show a tendency to separate if the granulations are in good condition when the grafts are applied and if care is taken not to rub them off.

A dry dressing is applied and is changed every day if there is any discharge from the surrounding granulations.

The accompanying photograph shows four grafts that are firmly adherent and stand out above the granulation surfaces like normal healthy tissues.

Photograph taken two weeks after the application of skin grafts to leg ulcer while frozen.

MURPHY BUTTON RETAINED FOUR YEARS

Complicated by Ulcer at Site of Gastro-Enterostomy

By A. F. TYLER, B.Sc., M.D., Omaha, Nebraska

THE following case is of interest because of its rarity and because of the pathology which was demonstrable at the examination. Through the courtesy of F. J. Schleier, who referred the patient, I am able to give the following history:

The patient was operated upon 4 years previous to our examination for chronic ulcer of the duodenum. When the abdomen was opened it was found that there were massive adhesions involving the duodenum and the distal portion of the stomach, as well as the biliary passages. On this account it was impossible to do a posterior gastro-enterostomy. Instead of this, an anterior gastro-enterostomy was done by the usual technique, following which an entero-enterostomy between the duodenum and jejunum was made. This opening was secured by the use of a good sized Murphy button. Although the stool was watched for a number of weeks following the operation, the button was never recovered. Because of the fact that no symptoms were produced the patient had never given the matter any concern.

At the time of our examination, the patient had been suffering for one week with a return of burning pain in the epigastrium which he described as the same pain he had before his operation, accompanied by nausea and occasional vomiting.

Roentgen examination revealed at once the Murphy button which at first observation was in the loop of duodenum. At later observations, the button was found in the stomach (Fig. 1).

Filling the stomach with an opaque meal revealed the gastro-enterostomy opening functioning but at the site of this opening an area of induration was seen which was very tender to pressure over the abdominal wall. We concluded, therefore, that the patient was suffering from an acute ulcer at the gastro-enterostomy opening and that the presence of the Murphy button was not the causative factor.

An interesting sequel to the roentgen examination of the stomach was the fact that within a few days the pain disappeared and the patient was symptomatically well. The improvement was noted the following day, gradually increasing until all tenderness and pain had disappeared. It is our opinion that the large amount of barium, six or seven ounces, contained in the opaque meal followed by a course of bismuth subnitrate, was responsible for this therapeutic result.

A search of the literature of the past 6 years reveals only two reported cases of Murphy button remaining in the abdomen over a prolonged period. A. D. Bevan[1] reports the removal of a Murphy button from the stomach two and one half years after gastro-enterostomy for duodenal ulcer. A. Wettstein[2] reports three cases of ileus from retained Murphy button. One of these buttons was removed 45 days, another 7 weeks and the third over 4 years after use. Since his three cases occurred in a close series he thinks he probably had defective buttons. The buttons were lodged 25 and 35 cen-

[1] Surg. Clin., Chicago, 1917, June.
[2] Cor.-bl. f. schweiz. Aertze., 1919, Mar. 29.

Fig. 1. Roentgenogram of Murphy button in abdomen 4 years after operation. No symptoms were produced by its presence. At one observation it was in the loop of duodenum, at subsequent observations it was in the stomach. It could be pushed about at will with no discomfort to the patient. The patient came for examination because of burning pain and tenderness in the epigastrium. An ulcer was found at the gastro-enterostomy opening.

timeters above the valve of Bauhin and considerable force was required to dislodge them.

The combination of Murphy button and of ulcer at the gastro-enterostomy site is not reported in available literature. Frequent mention is made of ulcer following gastro-enterostomy. It has been found that these ulcers recur following the use of non-absorbable sutures so that the use of absorbable sutures in gastric surgery is thought advisable.

In the case referred to above where the Murphy button was found in the stomach following an anterior gastro-enterostomy and a duodenojejunostomy non-absorbable sutures had been used on the outside with absorbable sutures on the inside. It is possible that as time has passed some of these sutures ulcerated through into the lumen. Since the examination, the patient has been entirely free from distress following large doses of bismuth subnitrate.

AN AMPUTATION STUMP RETRACTOR[1]

By P. W. SWEET, M.D., Rochester, Minnesota
Fellow in Surgery, Mayo Foundation

FIGURES 1 and 2 illustrate the use of an amputation stump retractor designed for the purpose of keeping the soft tissues away from the saw while an extremity is being amputated, and of securing an instrument which can be quickly applied and at the same time used for holding the bone steady while it is being sawed. Every surgeon who has done an amputation of a large fleshy thigh or arm has been aggravated and delayed by threads from a three-tailed muslin retractor being caught in the teeth of the saw and often because of insufficient retraction of the muscle and other soft parts of the stump, the bone is left too long; thus another amputation has to be made or the chances taken of leaving a troublesome stump.

Two sizes of instrument which will fit any sized bone of arm, forearm, thigh or leg, are fashioned, although the larger size fills the need in almost all cases. Both of the sizes are heavy enough so that strong traction can be made on the tissues and at the same time the bone is stabilized for sawing.

Two other similar instruments for the same purpose have been found on the market; one of Scandinavian, the other of English make. The Scandinavian instrument is designed with a diaphragm similar to the iris diaphragm of a camera; it is complicated, difficult of application, and has fallen into disuse. The English instrument is fitted with a sliding part so that the bone is entirely enclosed.

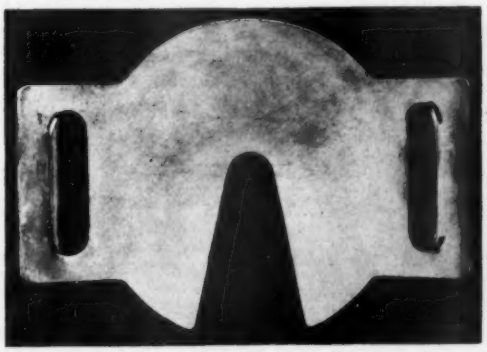

Fig. 1.

Fig. 2.

[1]Presented for publication, November 14, 1919.

FACILITY IN CLOSURE OF THE PARAMIDIAN UPPER ABDOMINAL INCISION

By CHARLES A. PANNETT, M.D., F.R.C.S., London, England
Assistant Surgeon, Royal Free Hospital; Supernumerary Out-Patient Surgeon, St. Mary's Hospital

THE suture of the usual paramedian supra-umbilical incision for approaching the upper abdominal viscera, occasionally presents considerable difficulties. The transversales muscles go into spasm and widely drag apart the lips of the aperture in the posterior rectus sheath. The suture material passing through this sheath with its transversely running fibers, tends to cut out, the sheath edges become frayed, and closure is only obtained by taking a wide bite of the rectus muscle. The result of this procedure is that an irregular non-peritonealized area is left on the inner aspect of the abdominal wound which favors very decidedly the formation of adhesions to the scar.

The mechanism of the production of this muscle spasm must be kept to the fore in devising procedures for overcoming it. It is a reflex, the afferent impulses of which arise, partly in the abdominal viscera and partly in the abdominal wall. When the principle of anoci-association was first widely advocated, I was able to show experimentally in the cat,[1] that the muscles of the abdominal wall could be thrown into spasm by electrical stimulation, not only of the parietal peritoneum, but also of the contained viscera. In view of the measures which have been proposed to eliminate this muscular rigidity, it is necessary to insist that such afferent muscle-spasm producing impulses may originate in such organs as the stomach, gall-bladder, and duodenum. Indeed, the anæsthetist of experience insists that roughness of manipulation in the upper abdomen very materially increases his difficulty in arriving at the muscular relaxation required by the operator. Another factor in maintaining spasm is the excess of carbon dioxide in the blood, an excess very difficult to eliminate in certain individuals. This carbon dioxide increase has a central action.

The measures which have been employed hitherto for overcoming the difficulty of suture, have been, either the adoption of spinal anæsthesia, or the local infiltration of the abdominal wall. Of spinal anæsthesia there is this to be said, that though it is the best method of banishing muscle rigidity, it is not always expedient to use it, especially for operations in the upper abdomen. Of the local infiltration method it is to be remarked that, as applied by many surgeons, it is not founded upon known physiological facts and established experimental data, and this accounts for its ineffectiveness, which has led so many surgeons to discard it as a routine technique. It was directed that the layers of the abdominal wall should be infiltrated step by step with 0.25 per cent novocaine solution. The adverse critics of this recommendation have only to point out that it is impossible to open the abdominal cavity to one side of the middle line in a painless fashion by this method. Unless

[1] Brit. J. Surg., 1914, Oct.

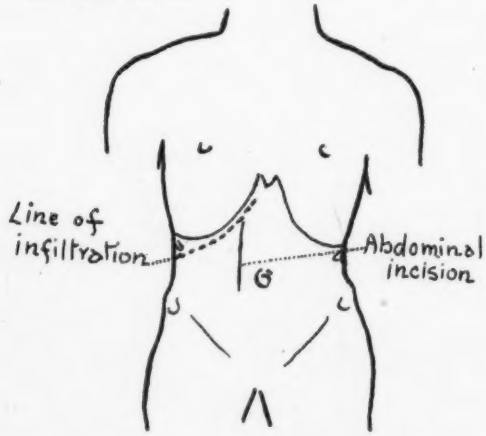

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

the strength of novocaine be increased to ½ per cent and adrenalin be added, and a sufficient time be allowed to elapse between the injection of the anæsthetic and the incision of the wall, anæsthesia is not obtained. Certain surgeons advocate the free infiltration of the rectus muscle and of the sensitive parietal peritoneum from its deep surface with ¼ per cent novocaine just before sewing up. It is not the rectus muscle which causes the wide separation of the lips of the deep rectus sheath; only one set of afferent impulses is blocked, and the method is obviously contra-indicated in the presence of sepsis, that is, in such cases for example, as a perforated gastric ulcer where ease and speed in suture are so advisable. If the use of novocaine to obtain relaxation is to be depended upon, it is better to attempt to block the efferent motor arc rather than the multiple afferent paths. This can be done by injecting a sufficient quantity of ½ per cent novocaine, to which has been added 2 to 3 drops of adrenalin (1:1000) per ounce, along a line parallel with the costal margin (see Fig. 1). If, as soon as the abdomen be opened, the left hand be inserted and brought in contact with the deep surface of the abdominal wall in this region, it will act as a guide in the injection of the anæsthetic solution from two or three skin punctures. Every layer of the abdominal wall can then be infiltrated and all motor impulses going to the muscles be effectively cut off. Since in the usual right rectus incision it is the right side of the sheath which retracts most (the left side being more anchored by the intact abdominal wall on that side), it is found very often only to be necessary to infiltrate below the right costal margin.

The simplest way, however, to facilitate suture under the trying conditions of muscle spasm is to use the pair of forceps depicted (Fig. 2). If the separated edges of the deep rectus sheath be seized with Spencer Wells forceps, it is always possible, with steady traction, to bring them together. If they can be held together in this position until a sufficient number of passages of the needle has been made to withstand the distraction strain, they will remain in position and the suture will not cut out. This can be done by the three-jawed forceps exhibited, and the manner of using them can be seen best from the diagrams (Fig. 3 and 4). By seizing the far edge of the sheath first, this, without any danger of tearing it with the rounded extremities of the blades, can be dragged toward the near retracted edge. The near edge can then be grasped in the other jaw, when the two margins will remain in contact for suture. Four such forceps are necessary for the ordinary sized wound, but six should be available.

The use of these forceps renders what is often a tedious time-consuming procedure, a comparatively rapid and easy one.

ENUCLEATION OF THE EYEBALL AND ITS SUBSTITUTE OPERATIONS

By JOHN E. WEEKS, M.D., F.A.C.S., New York, and ALLEN GREENWOOD, M.D., F.A.C.S., Boston

IN considering the operation best suited in any case where enucleation or a substitute operation is contemplated, the condition of the eye will determine within certain limits what operations are feasible. Thus, if there is an intra-ocular growth, if the globe is greatly shrunken, if the eye threatens to excite sympathetic inflammation in its fellow, the entire globe should be removed. If these conditions do not obtain, operation contemplating the retention of a portion of the globe may be performed.

There are many modifications in the performance of enucleation, but certain principles should govern the operation which, if observed, will produce as good results as may be obtained by the modification:

1. Retain all conjunctiva possible.

2. Dissect close to the sclera, removing as little extrabulbar tissue as possible.

3. When intra-ocular tumor is present remove at least 1 centimeter of the optic nerve next to the eyeball; otherwise, sever the optic nerve quite close to the eyeball.

4. In dividing the optic nerve, cut from the nasal side in order to avoid the possibility of perforating the os planum of the ethmoid.

Anæsthesia. General anæsthesia is preferable as a rule, but when certain conditions obtain, as defective heart action, advanced arteriosclerosis, extreme age, chronic bronchitis, etc., local anæsthesia is desirable. This may be obtained by instilling a few drops of a 4 per cent solution of cocaine into the conjunctival sac, and after 5 to 10 minutes injecting 10 to 20 minims of a sterile 1 per cent solution of cocaine, novocaine or alypin, to which a few drops of adrenalin chloride (1:1000) are added, 4 to 4.5 centimeters deep into the orbital tissues in the vicinity of the ciliary ganglion, entering the orbital tissue either through the conjunctiva near the external canthus or through the skin, about 1 centimeter to the outer side of the external canthus. In all of the cases operated on under local anæsthesia, some degree of pain is complained of.

The proper enucleation of the eyeball was performed first by Bonnet 1841 (1), the operation being based on his studies of Tenon's capsule, also known as Bonnet's capsule.

Briefly, the operation is as follows: The conjunctiva is seized by fixation or mouse-tooth forceps, about 3 millimeters from the margin of the cornea, and divided at the corneal margin. The incision is continued around the cornea and the anterior portion of Tenon's capsule separated from the sclera back to the insertion of the recti muscles. The tendon of the external or internal rectus, as may be more convenient, is lifted on a strabismus hook and divided so as to leave a very short stump (½ to 1 millimeter) attached to the sclera to afford a hold for the fixation forceps. All of the other recti muscles are lifted on the strabismus hook near the sclera and divided close to the sclera. The globe, if not too large, may now be luxated in front of the blades of the speculum which are partly closed to support it. The stump of the lateral rectus first divided is now seized with the fixation forceps, the globe slightly rotated outward, the enucleation scissors passed from the nasal side and the optic nerve divided. The eyeball is rotated outward, the remaining orbital tissues and the tendons of the oblique muscles divided close to the sclera and the eye removed. The margin of the divided conjunctiva and the very anterior margin of Tenon's capsule are now caught in a purse-string suture, and the opening closed by tying the suture rather loosely. Some operators omit the suture, but if this is done polypoid masses may develop at the site of the conjunctival opening.

The substitute operations are performed for the purpose of producing a cosmetic effect better than that obtained by simple enucleation. Many, if not all, of the substitute operations accomplish this result.

The substitute operations may be considered under two heads:

1. Those which consist in the removal of the entire globe, followed by the implantation of some substance into the cavity of Tenon's capsule either at once or some time later (delayed implantation).

2. Those in which the whole or some portion of the eyeball is retained (a) without implantation; (b) those in which some substance is implanted within the fibrous coat of the eye.

To the first belong the following operations:

1. Filling the cavity previously occupied by the eyeball with paraffin (Suker, 2; Ramsay, 3; Spratt, 4).

2. Turning in a piece of integument either from the lower lid (Maxwell, 5) or from the temple (Cross, 6). Inserting a glass or gold sphere (Frost, 7). Inserting the eye of a rabbit (Chibret, 8). Inserting a mass of fat (Barraquer, 9). Inserting a circular piece of skin and underlying fat from the deltoid region (Rollet, 10), etc. Wire balls, balls of silver, hollow rubber balls, balls of polished bone, balls of elder, pieces of costal cartilage, etc., have been used. It has so far been found that fat, glass and gold balls and cartilage produce the best results.

To the second group belongs opticociliary neurectomy (Boucheron, 11); anterior amputation with retention of a part of the contents of the globe (Critchett, 12; Lagrange, 13).

Evisceration. This includes the operation of Noyes (14). Freely incising the cornea and wiping out the contents of the globe; the operation of von Graefe (15) consisting in excising the cornea and ciliary zone and removing the contents of the globe; also the operations of Ahlstrom, de Lapersonne (16) and Nicati (17). Nicati's operation which is termed subenucleation consists in excising the posterior third of the eyeball, removing the contents of the globe, preserving the anterior two-thirds of the fibrous coat including the cornea. Gifford's (18), in which the entire sclera and cornea are retained, the contents of the globe being removed. Huizinga's (19), evisceroneurotomy consisting in removing the anterior portion of the fibrous coat, as in Mules' operation, but making the long diameters of the opening in the horizontal meridian, then excising a circular portion of the sclera at the posterior pole of the globe, including a section of the optic nerve and short ciliary nerves and ciliary vessels, and removing the contents of the globe. An artificial vitreous may or may not be inserted.

The insertion of an artificial vitreous. This includes Mules' (20) operation, in the performance of which glass or gold balls should be employed, of a size small enough to permit of closure of the scleral opening without any pressure whatever, and Barraquer's (9) modification of Mules' operation in which a mass of fat from the gluteal region is used instead of the metal or glass ball. Dimity (21) has devised a modification of Huizinga's operation, excising the cornea and ciliary zone and removing a disc of sclera, including a section of the optic nerve and short ciliary nerves at the posterior pole, and after removing the contents of the sclera thoroughly, inserting a gold ball, suturing the sclera over the ball. The conjunctiva and Tenon's capsule are not drawn entirely over the sutured sclera, leaving a small area to cicatrize in order not to compromise the conjunctival sacs, for the purpose of permitting greater movement of the prothesis.

Morax has recently been employing sheep or bovine cartilage for insertion into Tenon's capsule and into the sclera in place of glass or gold balls. He keeps the cartilage in formalin, 10 per cent, until wanted. It is then soaked in alcohol to remove the formalin, and later in sterile water to remove the alcohol, then cut to the right form and introduced aseptically. Excellent results are claimed from the use of this material.

Inspection of the cases presented, will convince one that a substitute operation should be performed whenever the condition of the eye to be removed will permit, if the individual is not too far advanced in years.

I am greatly indebted to Doctors Reese, Shine, and Key for their kindness in presenting cases.

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DISCUSSION BY ALLEN GREENWOOD

Technically speaking substitutes for enucleation mean some method of treating an eye, which should otherwise be enucleated, by which part or the whole of the globe may be retained.

Under the heading "Additions to Enucleation" will be grouped those methods which, after an eye has been enucleated, are used with the intention of improving the appearance of an artificial eye.

SUBSTITUTES FOR ENUCLEATION

Of the substitutes for enucleation evisceration is the one most commonly used and this operation is to be preferred to enucleation under the following conditions: first, in the presence of a panophthalmitis following a perforating wound of the eye or a perforating serpiginous ulcer; second, in the presence of orbital cellulitis when the eye itself is also involved in the suppurative process; third, in cases when the eyeball has been so torn to pieces that it would be difficult to do a simple enucleation, as seen so frequently following shell injury. The stump resulting from a well-performed evisceration is a very good one and allows for considerable movement of the artificial eye.

Another substitute for enucleation which formerly was frequently employed consists practically of an evisceration, with the addition thereto of a small glass ball sewed into the sclera (Mules' operation), thus retaining a portion of the eyeball with the muscles attached. This provides an excellent stump for the wearing of an artificial eye, and in this particular is better than a simple evisceration, but frequently the glass ball is extruded.

Still another substitute, very rarely used at the present time, is an opticociliary neurectomy, the object of which is to prevent recurrence of pain and still allow the eyeball to be retained.

ADDITIONS TO ENUCLEATION

Many surgeons are in the habit of performing a simple enucleation without regard to the cosmetic effect. This I feel is a mistake for it seems to me that there are two things always to be considered where the question arises as to the enucleation of an eye. First and foremost, is conservation of vision for the opposite eye and second, the preservation for the patient of the best appearance possible. It is perfectly possible for a general surgeon to enucleate an eye, but in the writer's experience the removal of such eyes is usually done with the removal of most of the contents of the orbit, leaving the patient with a very unsightly appearance. Some good ophthalmic surgeons are still doing simple enucleations without any attempt to suture muscles or in any way make efforts to improve the patient's appearance. I rarely have a patient needing an enucleation who is not desirous that the artificial eye shall look as near as possible like the other and this desideratum can never be obtained by the simple enucleation of the eyeball.

A great many additions have been brought out in recent years and the first and simplest was the suturing together of the recti muscles following an enucleation. This left a better stump than if the muscles were allowed to fall back but it was such a small stump that it allowed the upper lid to sink in, and the artificial eye always had a sunken appearance with only moderate movements.

In order to increase the size and consequent motility of the stump various substances were placed in Tenon's capsule within the cone of muscles with the idea of their retention. Following the use of the hollow glass spheres in Mules' operation surgeons began to use these same spheres in Tenon's capsule. It was soon found, however, that these small Mules' spheres were easily extruded or misplaced and still allowed the upper lid to sink in.

Some 20 years ago the author began to use larger glass spheres for this purpose and has constantly advocated their use ever since. A sphere smaller than 18 millimeters is practically never necessary and usually a 20-millimeter or sometimes a 22-millimeter sphere is implanted in Tenon's capsule. A 20-millimeter hollow glass sphere makes a stump large enough so that in subsequent years there is no sinking in of the upper lid, and this is surely the condition most to be desired. As the muscles are always fastened together in front of the glass sphere, good movement is always imparted to the artificial eye. It is essential to prevent extrusion of the glass globe that it be fastened carefully in Tenon's capsule before the muscles are fastened together. The conjunctiva should be sutured with sutures at right angles to the palpable fissure in order not to shorten the conjunctival space laterally. The writer has performed this operation nearly two hundred times in the past 20 years and in only one case has the glass sphere been extruded, thus proving that, with a large sphere, carefully placed as directed, there is no need of this accident. The cosmetic effect in all these opera-

tions has been most excellent, many patients being able to go about without anyone suspecting but what they had two good seeing eyes.

Various other materials have been used in place of the hollow glass spheres; fat taken from the abdomen, requiring a second operation on the patient, decalcified bone, paraffin, sponges, and other materials. The writer has had no experience with these substitutes for the glass globe but is of the opinion that probably in the future decalcified bone may be more commonly used.

Many surgeons use gold or metal spheres in place of the glass sphere, fearing that the latter may be broken. This accident the author has never seen and, while he occasionally uses a gold sphere, he has practically decided from his experience that the glass sphere answers all the requirements.

CORRESPONDENCE

TREATMENT OF EMPYEMA

To the Editor:—In a paper entitled "Empyema", which appeared in the January, 1920, number of SURGERY, GYNECOLOGY AND OBSTETRICS, Alexis Victor Moschcowitz makes the following statement:

"Putting theory aside, however, early thoracotomies are attended by a terrible mortality, as the statistics in our military camps during the epidemic of 1917 and 1918 woefully testified. Early operations were probably prompted by the enthusiasm of both internists and surgeons, who for the first time saw empyemata in large numbers develop under their very eye, and felt that early operation, which in other suppurative surgical affections is a great desideratum, would give similarly brilliant results. It was only when frightened by the formidable mortality that a halt was called on early operations, and the statistics improved. The patients died not only in large numbers but promptly after the operation. When we consider that these operations were done upon a patient who was at the same time sick unto death with an active pneumonia, it is not surprising that the mortality was so large."

The time to operate in a given case of empyema should be determined solely by an appreciation of the amount of damage the exudation in the pleural cavity is causing the individual. If the patient seems likely to perish because of an intense toxæmia, the major source of which is absorption from the pleural surfaces, it would seem to be wise to evacuate it without regard to the stage of the disease. If death appears imminent from the pressure exerted by a large collection, it certainly is perfectly proper to relieve that pressure at any stage of the disease.

Early operation in empyema, that is costatectomy, fell into disrepute largely because too much was expected of it. It is no panacea, but it certainly is not a dangerous procedure and of itself it does not kill or even produce any appreciable degree of shock if done under local anæsthesia.

The situation in my service was something like this: A soldier contracted pneumonia which would run a more or less stormy course. About the time the temperature reached normal there would be a sudden rise with aggravation of the other symptoms and the physical signs of fluid would appear. Aspiration would be done and repeated while he was on the medical service, until the fluid was macroscopic pus when he was sent to the surgical service. If he died while still on the medical service his death was recorded as due to pneumonia. But if he died ever so shortly after a rib resection his death was due to empyema.

This made the statistics of rib resection look bad. I submit, however, that no just conclusion can be reached without a knowledge of the number of fatalities in the same class of cases which were not subjected to rib resection, or thoracotomy.

In the very virulent infections where the exudation into the pleural sacs occurred early in the course of the disease, the advisability of some form of permanent drainage was a question much discussed by the members of our staff. The exudate in these cases consists of a bloody pus too heavy to run through an aspirating needle. Cultures show the hæmolytic streptococcus to be the predominating organism. There can be no doubt about its extreme toxicity.

If a simple thoracotomy is done on these patients most of them will die, and the operation will get the credit of contributing to the fatal termination, whereas if left alone to struggle against the toxins absorbed from a large absorbing surface, they will surely all die. The body has not had time to build a protecting wall against the absorption of this material. It certainly makes one review his reasons for the procedure to have a succession of fatalities,

and this was my experience, but I also have the comforting assurance that two lives were saved which would, in my judgment, have been lost had not an exit been provided for several hundred cubic centimeters of virulent pus. I have not seen a death in these cases which I thought was caused or contributed to by the operation. On the other hand, I have seen cases which were operated upon in spite of an obviously fatal prognosis, live much longer than was anticipated.

I have failed to appreciate the danger attributed to the artificial pneumothorax in these early cases. My experience is that the patients are immediately much more comfortable as soon as a large collection is withdrawn notwithstanding the fact that the fluid is replaced by air.

We freely admit "that statistics improved" after a halt was called on early operations in these cases, but we do not admit that fewer died from the affection. When one refuses to operate upon any but the late cases he allows a certain number of the acute cases to die that might have stood a chance with drainage.

As stated above the question should be decided by a consideration of the amount of damage the pleural effusion is doing in the individual case. We have seen comparatively large effusions of pus which were discovered accidentally and were the cause of very little distress. We have seen small effusions or purulent exudations which we thought at least were adding materially to the patient's toxæmia and lessening his chances for recovery and we have seen the fever drop and the symptoms improve at once on the removal of such an exudate.

There should be no hard and fast rule promulgated for the treatment of these cases but the decision as to whether to operate or not to operate should be arrived at after a study of each case.

BUDD VAN SWERINGEN, M.D.

Formerly Chief of the Surgical Service Base Hospital, Camp Joseph E. Johnston, and General Hospital No. 25.

Fort Wayne, Ind.

TOXIC EFFECT OF FIBROID TUMORS OF UTERUS

To the Editor:—In the December, 1919, number of SURGERY, GYNECOLOGY AND OBSTETRICS, there is an article by R. R. Huggins, of Pittsburgh, on the subject of toxic effect of fibroid tumors of the uterus.

I was very much interested in this article and have noted many of the points brought out. However, I am constrained to believe there are other changes than those noted by the author; namely, changes in the cerebrospinal nervous system. Having had two cases which were to me intensely interesting, and thinking other surgeons might have observed similar results, I would report them briefly.

CASE 1. Mrs. B. white, age 50, with fibroid tumor the size of a cocoanut, entered the hospital for operation. The history, both personal and family, was negative except for symptoms of fibroid and the patient had had free bleeding for some time. Physical examination showed a large fleshy woman somewhat anæmic but not pronouncedly so; pulse, blood pressure, and temperature, normal; no evidence of cardiac weakness; urine normal. Under gas-oxygen anæsthesia a supravaginal hysterectomy was done. There were no complications, but the tumor was difficult to dislodge. The operation progressed very satisfactorily until about the time the stump was being dealt with when she developed a most pronounced tonic convulsion which lasted for probably two minutes; respiration ceased; she became cyanotic and had every appearance of an ordinary puerpural or epileptic seizure.

After the convulsion passed the operation was finished and patient put to bed in good condition. She went on to complete recovery with no further complications. She gave no history of ever having had any convulsions or any symptoms of grave nervous disorder.

CASE 2. Mrs. H., white, age 36, married 5 years, no pregnancies. Personal and family history was negative. Physical examination showed a woman well nourished but very anæmic. She gave a history of profuse menorrhagia for several months past. Hæmoglobin was 50, pulse and blood pressure about normal, kidney function good, no œdema, no headache and no dyspnœa. A soft blowing murmur was heard at the base of the heart, apparently anæmic. Vaginal examination revealed a fibroid tumor the size of a large grape fruit. She was put to bed and forced feeding with iron tonics prescribed. She was instructed to report at the first appearance of the next period; we wished her to regain as much blood as possible. She improved rapidly, hæmoglobin increased to sixty; in fact, the patient seemed to be in perfect health.

At the first appearance of the hæmorrhage she was sent to hospital and prepared for operation. She was catheterized on the table, eight ounces normal colored urine being obtained. Gas-oxygen was used as anæsthetic, preceded by morphine ¼ grain, atropin 1/150 grains, one hour before operation.

The operation was very simple and easy; there was no hæmorrhage or shock. Just about the time the stump had been completed she suddenly ceased to breathe and the heart ceased beating. With the right hand pressed up against the diaphragm not the faintest quiver could be felt about the heart. Cardiac massage was practiced with the right hand pressing the heart from below and the left on chest wall. After quite a lapse of time the heart began to act and breathing was established, and color returned. However, artificial respiration was kept up for some 15 minutes after the heart resumed action.

The abdomen was closed, breathing and pulse became normal, and the patient was put to bed in apparently a very satisfactory condition. After being in bed for about 30 minutes she had a most violent convulsion and never regained consciousness, convulsions recurring about

every 30 minutes to 2 hours, and she died in about 36 hours after the operation.

A catheterized specimen of urine was examined after convulsions began and showed quite a little albumin but no casts. The flow of urine was free and sufficient in amount. No history of any previous convulsions.

I was and still am unable to account for the cause of the symptoms. We at first decided it might be due to impurities in the gas, but as two other patients had been anæsthetized from the same cylinder with no bad effects, we decided this could not have been the cause.

I wonder if it could be possible that there could have been set free in the circulation some toxic substance that caused the convulsions in these two cases or could it be possible that the anæsthetic used could have played any part, as I have never seen such symptoms in a case when ether was used as an anæsthetic. If any one else has had such experiences I would be glad to hear from them.

I have operated upon many cases of fibroids under both gas-oxygen and ether, but these are the only cases I have ever seen which have had tonic convulsions develop during or so shortly after an abdominal or pelvic operation. There is at least to my mind a suspicion of some tumor intoxication.

L. L. SHEDDAN, M.D.

Knoxville, Tenn.

IN MEMORIAM — EMMA B. CULBERTSON, A.M., M.D.

Emma B. Culbertson, a member of the staff of the New England Hospital for Women and Children since 1883, died at St. Petersburg, Florida, January 8, 1920. Dr. Culbertson was well known as one of the prominent Boston surgeons for many years, a member of the American College of Surgeons, the American Medical Association, the Massachusetts General Society, National Women's Medical Association, Women's City Club of Boston, and other organizations interested in all movements for the advancement of women.

Be It Resolved, That we, her colleagues at the New England Hospital for Women and Children, deplore her loss.

We shall miss the inspiration that her constant enthusiasm and untiring service has been to us in our daily work.

EMILY F. POPE, M.D.

Secretary Medical Staff, New England Hospital for Women and Children.

Boston

TRANSACTIONS OF SOCIETIES

CHICAGO GYNECOLOGICAL SOCIETY

REGULAR MEETING, DECEMBER 19, 1919, WITH DR. ARTHUR H. CURTIS, PRESIDENT, PRESIDING

OVARIAN CYST

DR. RUDOLPH W. HOLMES presented an ovarian cyst, removed in the early puerperium. The patient was 33 years of age; second child, the first being a boy born in 1915. She menstruated last September 15; life was felt January 12; labor due June 22. She was seen on April 15, when everything appeared normal. On April 25 contractions began and recurred at irregular intervals; on the 29th she went to the hospital for two days. She was quieted by means of bromide, and went home. Labor was uneventful and terminated at 3 a.m. on April 30 (?). The child presented, the cord advanced immediately, and the placenta was delivered by expression. Twelve or fourteen hours postpartum the patient began having discomfort to the right of the uterus. At 7 p.m. the pain became severe, and the interne discovered a mass to the right of the uterus, 2 or 3 inches below the fundus. Leucocyte count, 18,000. The patient was seen at 9 o'clock and the tumor was a finger or two above the uterus; the interne had seen her at intervals during the 2 hours and found the tumor enlarging from time to time. A little after 9 the leucocyte count was 22,000. About 11 o'clock the husband arrived at the hospital after being telephoned for. The abdomen was opened, and a considerable amount of blood escaped. An ovarian cyst was found to the right of the uterus pushing the uterus to the left. The apex of the tumor rested at the brim and not in it. There were three twists in the pedicle and tube. The tube was much congested, and when the abdomen was opened blood was still oozing from the fimbriated extremity. The tumor was free and easily lifted up. Forceps were applied and the mass cut away. The abdomen was closed after cleaning out such blood as could be reached. Convalescence was uneventful; the highest temperature was on the second day, 100.2° F., pulse never above 85.

The interesting feature in this case is that a tumor of this size could lie behind the uterus during the months of pregnancy and not be noted until after delivery. Whether the tumor developed during pregnancy or antedated pregnancy is not known. It did not go into the pelvis or produce any abnormality in the birth of the baby and recovery was prompt. Probably one of the most fruitful causes of death from ovarian tumors with a twisted pedicle is that there is commonly a long interval between the first symptom and the time relief comes. When cysts are removed before gangrene occurs the chances are good. I have had four similar cases, two in pregnancy and two otherwise, and one that refused operation. In the two cases in pregnancy the pregnancy continued without disturbance.

DISCUSSION

DR. EMIL RIES: This very interesting case arouses my curiosity in three respects: first the medico-legal aspect. The doctor says he waited for the husband to come and give his consent. I do not know whether it is generally known that a husband can neither give nor withhold consent if the wife is in her right mind.

The second point is in regard to the torsion of the ovarian tumor. When an ovarian tumor in its natural growth comes out of the pelvis and grows from the true pelvis into the abdominal cavity, it usually falls forward, and that is the beginning of torsion. Thence torsion continues until the circulation is obstructed. Of course there are exceptions to this natural torsion of the ovarian tumor. I would like to know if torsion in this case was in the usual direction. It is conceivable that in the course of emptying the uterus in labor a torsion of an ovarian tumor may be produced which would be different from that ordinarily found.

The third point is in regard to the increase in the leucocyte count. An ovarian tumor that is undergoing twisting is a grave menace; in the presence of the enormous hæmorrhage the leucocytosis simply indicated the presence of anæmia. I would like to learn whether there was a decided change in the red count, which would explain the leucocyte count. It was not stated whether a differential count was made.

DR. ARTHUR H. CURTIS: I would like to have Dr. Holmes tell us whether the Credé or other abdominal massage was used, and whether the patient had any appreciable fever.

DR. RUDOLPH W. HOLMES: I know what the law is on the question of consent; the wife alone may give consent so long as she is mentally competent; the husband alone or a child under sixteen has nothing to say. But still, in the period of getting ready, the wife wanted her husband's consent. In a case of hæmorrhage I would not wait.

As I remember, the pedicle twisted from right

to left. Probably it was twisted beforehand; so commonly the twist is there with an ovarian pedicle. It was probably this process that caused the dry delivery and immediately after increased the torsion and obstructed the circulation. The patient went for several hours following delivery without discomfort. At 7 o'clock agonizing pain began and continued until she was relieved. In the hurry I could not get a record of the blood count and I think a differential count was not taken. The leucocyte count was taken as a matter of form, but no red blood count was made. She did not have an enormous amount of blood in the abdomen, but blood was evident; there may have been a couple of ounces altogether. There was no undue bleeding at birth, and the bleeding that comes with a normal puerperium had not yet manifested itself.

She had no temperature at all except on the second day, when it was 100.2° F., with a pulse of 80.

IMPROVED FORCEPS FOR REMOVING FOREIGN BODIES FROM BLADDER

DR. CHANNING W. BARRETT: I wish to present a new instrument that may be of help to some operators. It is to be used in place of the Kelly forceps to remove foreign bodies from the bladder. It occurred to me that a forceps of this type, guided by a cystoscope, the two introduced side by side, could easily remove a foreign body, and I have found that it works very nicely. I know of no instrument that would give more of a grasp to a foreign body, as for instance a hairpin. I have had no difficulty in using the forceps and cystoscope side by side in the female urethra. I insert the forceps first and then the cystoscope, and after grasping the foreign body remove the cystoscope, leaving more space through which to remove the foreign body.

ABDOMINAL SURGERY IN THE CASUALTY CLEARING STATION AND EVACUATION HOSPITAL

DR. WILLIAM THOMPSON read a paper on war surgery of the abdomen. (See p. 398.)

DISCUSSION

DR. GEORGE DE TARNOWSKY: The paper was extremely interesting. I know what a large experience Dr. Thompson has had in France, first with the British and later with our forces. The part that interested me most was the question of what should be done with the untransportable case. We must recognize the fact that the American Army entered the War 6 or 9 months before it was prepared, and when we had to go in line and do our bit to end the War in 1918, we were handicapped. We lacked many things; among them front line equipment. We had no method of taking care of our cases where they should have been taken care of—as near the front line as possible—and the result was that many of the wounded men reached the hospitals long after the wound had been received; some already moribund. The French had begun to increase their auto transports, but I must give credit to the Italians for having the best of all. They had large trucks, six, eight or ten, with collapsible walls, that could be run up into the battlefield and be ready to operate within one and a half hours. I was fortunate enough after the armistice to be put in charge of one of these ambulances or *auto-chirs*. The Italians had seven in line at the time of their last offensive. Their final report showed a total of 16,500 severe and untransportable cases operated upon by these transport units. Bastianelli, of Rome, told me that of these they felt positive that at least 8,000 had been saved by them. Not only were these ambulances able to go close to the Front, but the best surgeons possible were sent in them. If the war had lasted until 1919, we probably would have had similar equipment. As for the lack of surgical teams, that was well known. I had just the same experience as Dr. Thompson had; I would telephone Headquarters for surgical teams and they would appear two, three, or four weeks later when we had no use for them. When the offensive occurred and the Germans were in Chateau Thierry we lacked everything. I did not even have my operating room up. In the field next to me was an operating team awaiting orders. For 5 days I tried in every possible way to have that team and field hospital assigned to me. I could not do it. Finally the Commanding Officer came over himself and we put up his little operating room and did our first operating in this little room, which I could not get assigned to me. That was our experience throughout the war. It seems impossible to get the Q.H.D. to operate rapidly. Regarding the movement of every surgical team as it landed in France, in 1918 I received an entire Hospital Unit as part of my staff. They had just landed in England and were assigned to me. They were excellent surgeons, all of them, but they entered the hospital with civilian ideals, taking forty-five minutes on a surgical intervention. With a great number of cases there we could not do that and we had to educate the surgeons not to pay any attention to the finer details. We had to evacuate our cases and make room for more, evacuating four or five hundred who could reach some of the base hospitals. The intervention must be extremely rapid, doing the important things and not spending a minute on useless, finer details.

There are lots of other points to talk about and it is hard to know where to begin and where to end. I enjoyed the paper very much and think we owe Major Thompson a vote of thanks for his excellent exposé.

DR. CHANNING W. BARRETT: Many of the surgeons who remained here in the United States undoubtedly had excellent experience in surgical work that was more like that of civilian life. Those of us who went to France so very early and stayed

late saw much surgery that has no similarity to private practice. I think those of us who are here tonight will say that the cases of abdominal injury, gunshot wounds, should all have an exploratory laparotomy, or nearly all. It did not take long over there to find that every patient who had a gunshot wound had better chances if operative procedures were instituted. The reason has been recounted by Dr. Thompson. We were not prepared for surgery, just as we were not prepared for many other things. At the Battle of Chalon the French had a hospital that was complete in every detail. They told us in March that at that place we would need an evacuation hospital. The battle began on a certain Monday. Our evacuation hospital arrived there from the States, on that ground in a wheat field, with tents, with everything to be made, six days before the battle commenced, and every man in connection with that work was new to army work except the Commanding Officer, who was a regular army man but who was very much unused to things in France. You can imagine the kind of organization. Before the operating tent was finished and with equipment very much lacking, they were digging trenches to put in pipes to run the water in. The battle started and the men began to come in at 6 o'clock in the morning. It was 11 o'clock before a man was put on the table. Six hundred came in that day and, contrary to the belief among some that only those who are able to go back very soon into line were given first aid, the worst cases were selected for the first operations. They were fairly well cleaned up the first day, and the next day the ones that had been left for the second day were worse than the ones that were operated upon the first day, and the ones that were quite trivial when they came in were worse on Wednesday than the worst cases on Monday. A great many difficulties of that kind were encountered. There was lack of experience, lack of equipment, men sent over as surgeons who received their appointment through politics and never did any surgery. There were men in command of teams with majorities who had had nowhere near the experience of the lieutenant under him. When they were coming in that way, more than the surgeons could get at even by operating 12, 24 or 36 hours, stopping only for nourishment—sometimes not nourishment but something that we swallowed, and sometimes good food, but not in those localities—you can see that we had our own troubles. When it made a great deal of difference whether these men went over from one day to another, it will be seen that a team must work at high power to care for as many cases as possible to save life. A team consisted of an operating surgeon, two assistants, usually two lieutenants, two nurses, and two orderlies. If they had the operating-room space and the tables they cared for a patient about every 10 minutes and that is somewhere near the degree of speed that must be attained to accomplish very much under these conditions. If this speed was not attained there were not sufficient teams to do justice to those who were waiting. When enough men came so that we could work in shifts, we worked in twelve-hour shifts, but that was too long for a team to work. It would be better to work in eight-hour shifts, that is long enough to get the best work out of a team. When you are working to get a man off the table every 10 minutes you will see that with a laparotomy coming along that, with his other injuries, is going to take an hour of time, it will not be justice to the other men waiting unless the patient on the table stands a fair chance of living. If the patient on the table were the only patient to deal with and you approached that laparotomy with a good night 's rest behind you and there was nothing else waiting, the patient would stand a better chance of recovery, but as you approach that operation after having worked until you have seen all the surgery that you care to see, and find it is a procedure that is going to take an hour of time, the patient will not stand much chance of recovery, and at the same time some other man is put off until the chance to save his arms or legs, or his life is gone. So there is a question as to how much laparotomy work can be done. And yet the tendency is for civil surgeons going into army work to see every man get well. It is one thing to operate on gunshot wounds in our hospitals here where they come for only a few blocks and you see them immediately afterward, and another thing where they have been lying for hours on the battle field, losing a great deal of blood, and they have been picked up and taken from one place to another and finally arrive at a place where they can be operated on. It would be a good deal like having a man injured at Gary and brought in here during one of the worst snow storms we have ever had. The men might come from only five miles back of the lines about five hours after the injury, or they might come twenty miles twenty hours after the injury. It is more important to get things up to the line that are needed there than to get things back to us; so there was delay and delay.

I am glad to hear this paper, especially so as I visited Doctor Thompson's habitat. I remember one Sunday going over to his Division to visit some men. I did not know that Doctor Thompson was there when I started out on one of the most hellish automobile roads I ever saw. It was full of shell holes, dead horses, dead men, and a most awful odor. We stopped at a shell hole and got an odor which proved that the shell hole had been used as a burying ground for some soldier. We were on our way to Reddy farm and when we got there found Doctor Thompson and another man from Detroit ensconced there to take care of injured men who could not be taken elsewhere. I did not find Doctor Thompson at home—he had gone out in "No Man's Land." Not far away over a hill a little ways was the grave of Quentin Roosevelt. The shells were exploding then at a very short distance. These conditions are not favorable to laparotomy work and yet that is the only place that

laparotomy work can be done with any chance of giving the man a chance to live. He cannot ride to the evacuation hospital with an abdominal injury and stand much of a chance to live, and so you are between the devil and the deep sea to get close enough to give the man any chance to recover and yet have conditions that will give him any chance to recover. These conditions are determined by having a good, experienced operator there. That locality was fortunate in having such a man as Dr. Thompson; his type of man was not in that territory very much. We should have good facilities for reaching the place, and sufficient quiet from the front line so that the laparotomy patient is not in constant fear. He may have been very brave at the front, but after a laparotomy he is afraid and should be a long way back to recover, but the work should be done at the front. Ideal conditions are not frequent enough to make laparotomy work attractive at the front.

DR. WILLIAM M. THOMPSON (closing): I wish to thank you for your interest, Dr. Tarnowsky, and my good friend Dr. Barrett, I thank you both for your remarks. They only serve further to emphasize all that I have been trying to bring out. We were not prepared and the next time we will not be ready unless we do differently than we have in any of our wars.

CRITERIA OF PHYSIOLOGICAL FUNCTION OF THE FALLOPIAN TUBES

DR. EMIL RIES: Sterility of the female is very hard to explain. The female sexual tract is the most poorly constructed structure with which we have to deal. From the slight tearing of the cervix during the passage of the child to the very severe hæmorrhage which may kill the mother, the whole sexual life of woman is a continual series of narrow escapes between life and death. We have never been able to understand why woman menstruates; she has lived before she menstruated and after she has menstruated; she can have children while not menstruating — apparently she can perform all her physical duties without menstruating.

As to the cause of sterility, there are a few apparently evident causes which should be very hopeful fields for our therapeutic efforts. Certain causes of sterility are evident and apparent to the most superficial glance. I refer to those obstructions of the tube which are visible to the naked eye. The tubes are usually closed at the abdominal end, and are closed potentially or histologically. The tube can be closed potentially by simple agglutination at the end of the tube, which can be opened by pushing against the end of the tube and allowing the occlusion to come out through the fimbriated end. But that is not the only way in which a tube may be occluded. A tube can be occluded, rarely histologically, at the uterine end. Of the thousands that I have examined in my life, I have found just one tube which presented a complete occlusion of the tube at the uterine end. There are pathological occlusions which occur at the uterine end. Such occlusions present an absolute obstacle to conception. When there is a hydrosalpinx or a pyosalpinx, or any disease of the tube that is palpable, our diagnosis will center upon this obstruction. But many times tubes are occluded at the end and have not filled up. How can we diagnose such conditions? It would be well to be able to determine without opening the abdomen, whether the tube is closed or not. I will mention sounding which has been attempted through the uterus with the aid of the cystoscope, or by the method of touch, but we have never heard of any success following such efforts. If you remember the lumen you will readily see why it is so difficult to pass a sound.

There appeared a communication by Cary and another by Ruben in the *American Journal of Obstetrics*, and another in the journal of SURGERY, GYNECOLOGY AND OBSTETRICS, advising the use of collargol in the uterus under some pressure so as to make the collargol enter the tube, with subsequent X-ray examination of the patient. That seemed rational. I have thought it was worth investigating and I have carried out this procedure on three patients. The temperature chart of the first patient shows a rise in temperature. The chart shows vomiting and nausea and that she had bowel movements regularly. In the course of two weeks the patient recovered. During that time pelvic examinations were made at one week intervals and at the end of one week we felt a hard mass in the cul-de-sac, which was not ruptured. At the end of two weeks the mass was gone and there remained nothing but a slight tenderness of the ligament. The uterus was the same as before. The patient left the hospital and has remained well, and has not become pregnant. The other two cases were much the same. The three were perfectly clean women; all three were prepared as carefully as for any abdominal operation and the syringe was cleaned with all precautions. Nevertheless, these patients developed acute peritonitic symptoms. I have, therefore, discarded this procedure for fear I will occlude an open tube rather than open one that was occluded before.

Are there any other methods by which we could determine the permeability of a tube before operating? I know of no other way. One method suggested itself. Inject into the uterus without force some Chinese ink, and close the tube temporarily with the forceps. If the tube is open the ink will have to go into the abdomen. A few hours later if we make a small puncture and withdraw some fluid and it contains ink we will know the tube is open. I have not had the courage to do anything more since this last experiment.

If we cannot make the diagnosis beforehand, are we any better off with the abdomen open? When the abdomen is open and we see a fimbriated end, do we know that the tube is permeable? We do not. It may have an occlusion at the other end which we

cannot diagnose. Other ways of diagnosing that condition I do not know, so that in the face of the patulous tube we do not know whether that tube will perform the function of carrying spermatozoa. If the tube is permanently closed one would think that if the closure is opened the tube should do its work if the epithelium of the tube is at all normal. What is the epithelium in hydrosalpinx? After the fluid has escaped you can see that tube fill itself up, so you would expect it to functionate again.

Two years ago I operated for hydrosalpinx in a young woman who was anxious to have children. I removed the abdominal ends of the tubes and sutured them in the proper way and examined the other ends. We had first examined the woman's husband and knew that he had spermatozoa but the woman has not conceived in two years.

In a pyosalpinx, how do we know that the tubes can take up normal function? With the microscope perfectly good epithelium is found. Perhaps some of the epithelium has become lacerated and there are septa across the tube, and yet that tube should be perfectly able to recover and return to normal function. In a review of the results in some forty-odd cases, Bullock, of New York, reports three successful cases. He first operated years ago in cases where pus was present but the tube not closed. The operator cleaned the tube and the woman afterward became pregnant. If a tube contains pus, I think we should fear leaving such a tube, for we do not know what it contains. Suppose we make a smear during the operation and it is negative; on culture it may be found positive. We have not time to wait for a culture while operating. If the culture is positive and we find the gonococcus, how many surgeons would be willing to leave the tube? If I found the staphylococcus I would not know what to do, but if the streptococcus I would not be willing to leave it. The pathological examination would not help us much. Have we any criteria in such a case? The histological examination shows us only that a pyosalpinx is something that can be overcome and later permit a return to the normal. I have been examining my specimens and with the exception of one or two I do not believe there is one in my collection of hundreds where the condition of the tube would prohibit absolutely the return of that tube to normal. We find pus in the lumen but ordinarily find nothing to prevent its return to normal.

Have we any criteria in the course of an operation as to what to do with such a tube? That sounds like a pretty negative result of the examination of the question. We all feel safe with a hydrosalpinx. We would feel safe to leave it, but with a pyosalpinx I think most of us would hesitate to leave the tube. If it is a hydrosalpinx, how about it—do any of them ever allow conception afterward? I have followed up about twenty cases operated upon 12 years ago; of these twenty, three became pregnant and that is a pretty good percentage. One has had three beautiful children. Two have had nothing but abortions, but the three children are certainly worth all the operating on the other nineteen, because the operation is a perfectly harmless one and it is justifiable in hydrosalpinx. If there is a nodular condition of the uterine end, of course it is possible to carry out the operation Dr. Watkins advocated several years ago and stitch the tube in as far as may be necessary and unite it through the tube. This is a very simple operation which I have carried out in four cases, but none of them ever became pregnant. The anastomosis is a harmless operation and can do no damage.

All the women that I have seen with a hydrosalpinx acquired it from the puerperal infection. I have never seen a woman with a gonorrhœal pus tube become pregnant. Although it is claimed that in a gonorrhœal pus tube the plasma cells are present in good numbers, that should not interfere with return to normal for many of the other tubes.

Can anyone give us hope of bringing that tube to normal? I have found the question very difficult and hope you gentlemen will have better success in solving the problem than I have had.

DISCUSSION

DR. T. J. WATKINS: In the case referred to by Dr. Ries, the case of the anastomosis, the patient had a pyosalpinx on the other side. She wrote me that she was three months pregnant and had aborted. I am not absolutely certain as to whether she was pregnant or not, as I have never been able to confirm that.

The question as to whether the tubes are connected very often occurs to one in an attempt to treat sterility. We can make an incision through the fornix, something that can be done quickly, with very little traumatism and which will allow one to determine the condition of the tubes macroscopically. Especially can one determine whether the abdominal ends are open or not. Whether to open the abdomen to determine the condition of the tubes or not is decided by the condition of the patient and the history. If the case is a puerperal infection, then the fornix is much better. If it is a gonorrhœal infection one is hardly justified in doing this, or if the patient has had suppurative appendicitis I would subject that patient to the exploratory incision. One generally hesitates to subject a patient to much exploratory surgery if the husband gives much history of gonorrhœa. In one case a man whom I knew very well had had a number of attacks for a number of years. He had a double orchitis and a stricture which required urethrotomy. He asked me about being married. I advised him not to, but he got married and his wife had three children in five years. The wife never gave any sign of gonorrhœal infection except that she always had a flare-up of temperature during recovery.

We had to operate in two cases and saw the tubes entirely recovered from gonorrhœa where this was proved by abdominal section.

One was a case of a woman who had a very acute gonorrhœal peritonitis with an accompanying exudate that extended half way to the umbilicus. The husband had had acute gonorrhœa. This woman was extremely ill. Some five or six years later I operated for a large retrodisplaced uterus and, very much to my amazement, both tubes were absolutely normal so far as macroscopical examination was concerned. There were a few adhesions about the ovaries. The other case was that of a young girl whom I treated for acute gonorrhœa. She had an attack of salpingitis. She was not operated upon and, fortunately, recovered entirely. She had another attack of pelvic peritonitis and when she recovered I did an abdominal section and found both tubes were entirely normal. There were a few adhesions about the ovaries. I did not remove the tubes but following that she had an acute attack of peritonitis, and we concluded that it would be necessary to remove them. The abdomen was opened the second time and while the patient's tubes looked entirely normal we did not have the courage to leave them but removed them both and she has had no more pelvic peritonitis.

Dr. Channing W. Barrett: In relation to Dr. Ries' remarks about the collargol and the reaction from it, I might mention that it was the practice in one of the large clinics to inject the uterus with Beck's paste and if the paste was found in the abdomen when it was opened, it was certain that the tube was patulous and that it was safe to leave them. I have never had such success out of efforts at conservative work on closed tubes that encourages me to continue with such work. I have seen numerous instances where plastic work has been undertaken and the tube has rapidly developed a much worse condition.

Dr. N. Sproat Heaney: In looking at Dr. Ries' X-ray plates it occurred to me that perhaps one of the tubes is abnormally distended with collargol. I think Dr. Dickinson distended the tubes with collargol and took pictures. I saw several of his pictures but none of them had the appearance of this one. However, that would not account for the three patients having the rise in temperature. It did occur to me, though, that instead of taking on three cases it might be well to go back to the first and see whether then the tubes were occluded.

Dr. Mark T. Goldstine: Dr. Ries' remarks concerning the female genital organs were a shock to me. I am humble enough to think pretty well of Nature and Nature has treated me pretty well in medicine. If it were not for Nature I expect my mortality rate would be much higher. As regards the injuries to the female organs during childbirth, I think we might blame a good deal of that on the men. A great many women come to me first because they are forced to do so by their husbands, who are anxious to have offspring. If the wife does not become pregnant he makes a great "to-do" about it. Where Nature has lost the pattern and a girl is born without a vagina or tubes, the surgeon who makes an artificial vagina does not come anywhere near as good a result as Nature has in the first place, especially in bringing an intestine down and using it for a vaginal canal.

Dr. Rudolph W. Holmes: I frequently treat women who are sterile. They come because they have heard that operations may be done to overcome that condition. I always tell them to send the husband to me first so we can examine him before we operate. He never comes and she never comes back. Most men are willing to blame the wives, but they are not willing to be examined themselves. I am convinced that most of the sterility in families is due to the men.

Dr. Cary Culbertson: I think the great sterility in the patients who have a history of one attack, or repeated attacks of peritonitis is of great interest and that this has a real bearing on the production of children after the first attack, or becoming pregnant at least. The great proportion of our patients who come in with a pelvic mass, meaning bilateral salpingitis, give a history of never having been pregnant or of not having been pregnant subsequent to the first attack. That means, of course, in all probability, that the tubes are destroyed or put out of function as a result of that inflammatory reaction. Whether that causes hydrosalpinx or pyosalpinx we cannot tell until we see the tubes. If by operation or any other form of treatment we can cause a few of these tubes to functionate, why do not more of them become spontaneously cured? Why do we not have more pregnancies after attacks of acute peritonitis. I believe that gonorrhœal infection pure and simple is a relatively mild infection, and if there is no secondary infection the tubes may heal up. Of course, they may heal, but the patient is usually able to combat gonorrhœal infection. I think this explains the cases Dr. Watkins mentioned—the tubes have never become secondarily infected. In the majority of pus tubes that are not sterile we practically always see secondary infection, often colon bacillus infection. While it is true that they do show normal epithelium in parts of the tube, they do not show normal epithelium throughout the entire lumen, and the development of histological constriction or stenosis of the tube is usual close to the uterus in the narrow portion of the tube, or in the interstitial portion of the tube. But it seems to me that if we can succeed by operation in restoring to function a certain number of these tubes, more should spontaneously return to function than ordinarily do.

Dr. Theodore J. Doederlein: I have listened to Dr. Holmes' remark and it occurred to me that yesterday an attorney whispered to me not to mention that he had double mumps, as the patient was anxious to have children. So I think we should always examine the husband. Dr. Ries' remarks were so complete and he is so thorough that it is hard to discuss his paper. We have the puerperal infection which is a puerperal infection alone, and then of course we have the tubercular and syphilitic, which are very

rare primarily, but I hold that the gonorrhœal invasion of the genital tract is a destructive invasion. It is an ascending invasion of the mucous membrane and it leaves destruction behind. And these cases are the ones that frequently marry, and have one child. After the one child the woman is sterile. Why? Because after the congestion due to the confinement the old infection flares up and does the work that was not accomplished at the first invasion. So I believe that the infections *par excellence* are the gonorrhœal infections. On the other hand, in the puerperal infections we may have temperatures of 103 or 104° F. and have another pregnancy, and so on, until a woman dies from a flare-up of the infection.

I remember a case of a woman with a puerperal infection after a premature birth. She had pain at 4 weeks, not a parametritis. I had her in the hospital for 7 weeks and she was then all right but did not conceive. After a year she came to me more or less invalided. Perhaps I would not do it now, but I opened the pelvis and as the right side seemed the worst I left the left tube and ovary and removed the right. This was not a gonorrhœal infection but a streptococcic infection, which was present in the tube and possibly in the ovary. The woman promptly conceived and had a fine boy. I was telephoned for and upon examination found a large mass in the left side 5 days after confinement. She had a high temperature and died from general peritonitis.

I always take into consideration the wishes of the people when I operate, whether I should leave an obviously infected tube or not. It is a risk, but I tell the people about it.

DR. CHARLES S. BACON: Dr. Ries is speaking primarily of the criteria of the tube in the whole question of sterility, and I understand he is considering the function of the tube chiefly with the passage of ova and sperm, and if that does not occur the tube is not functioning properly. He has not mentioned the obstacles that are involved in the closure of the passage below the tube, or the failure of ovulation. Of course, it might easily happen that a tube will functionate and still there may be no fertility because ovulation does not occur, or there is an obstacle below preventing the passage of the ova upward. I should think it would be necessary in a full discussion of the subject to make the differential diagnosis of the location of the obstacle. I suppose we have seen, all of us, cases of sterility for some length of time from gonorrhœal infection, which has afterward disappeared. The point I particularly wish to emphasize is the question that the criteria of tube function is not entirely that of fertility. I would also like to suggest the possibility of any other tubal function beside that of offering passage for the spermatozoa. The very complicated arrangement of the tube would seem to be unnecessary for this simple passageway. Of course we know that the tube plays a part in the secretions. The amount of secretion is probably not altogether negligible and perhaps we may find eventually, when the tube is better understood, that it goes a little further.

DR. RIES (closing): I limited the topic of my paper to criteria of the physiological function, and I omitted to state specifically what Dr. Bacon kindly supplied. What is the function? So far as we know, nothing but the duct for the ova. The tube does not menstruate. We know of no physiological function of the tube. When the ova becomes settled in the tube we consider that pathological and not physiological. I have left out all the other causes of sterility.

So far as the histology of the tube is concerned, I wish to take issue with the speaker who mentioned the structure of the tube. The structure of the tube is apparent. If you take it and examine it microscopically you find it is not a structure; it is lined with perfectly good epithelium and even the worst pus tubes have the best epithelium at the narrowest part of the tube. Cary mentioned in his paper that the largest part of the tube gives the largest shadow on the X-ray picture, as Dr. Heaney said.

BOOK REVIEWS

A CRITIQUE OF NEW BOOKS ON GYNECOLOGY AND OBSTETRICS

By GEORGE GELLHORN, M.D., F.A.C.S., St. Louis

THERE is in recent writings a certain gloom over the fate of gynecology lest it be absorbed by general surgery. Those who advocate such a process, should read Sturmdorf's book on *Gynoplastic Technology*[1] and those who are opposed to such an amalgamation will take heart from its perusal. For by its mere existence, this book is a sort of reassurance. A monograph of 334 pages on the dynamics of the female pelvis and its practical application to operative procedures is necessarily based upon that close study and concentrated thought which go hand in hand only with specialistic attention. Nor is such a book superfluous at this time. The methods of plastic restoration of the injured birth canal which have been handed down to us by the fathers of gynecology, no longer correspond in all respects to the advancement of our conceptions regarding the physiology and pathology of the pelvis; and it is commendable that the changes be presented to us in a comprehensive form. It may be said at the outset that the author has fully attained his object. His intimate knowledge of the subject is evident throughout the book and manifests itself most happily in the chapter on vesicovaginal fistula. The brief historical introduction to this chapter is splendidly done. Only the milestones are mentioned, those that represent truly new principles in the development of the operation. The author's own contributions to the plastic surgery of the birth canal are set forth clearly and are accompanied by instructive illustrations. Among these contributions, his method of tracheloplasty deserves particular attention. It is sound theoretically and easy of execution, as the reviewer can affirm from personal experience. It accomplishes its immediate purpose in a startling manner and avoids the unpleasant sequelæ which we so frequently observe after the old methods. In this as well as in all other operative procedures the instructions given are quite explicit and leave no point in doubt. A warning against making record time seems especially opportune: "Anything like an attempt at speed in plastic work denotes the self-consciousness of the operator rather than his actual skill in this special branch of surgery." A friendly criticism shall not be suppressed. The author devotes a separate chapter to sacral anæsthesia (to the exclusion of all other methods) and goes to some length in describing the technique, only to condemn the procedure in the end. Why not omit this whole chapter?

The scope of the book is wider than its title indicates. In particular, the discussion of the cervical mucosa and the significance of endocervicitis is most valuable. The author stands here abreast of the most advanced conceptions. The cervical mucosa is much more susceptible to infection than the endometrium and may aptly be termed the tonsil of the uterus. Infection travels upward through lymph channels and by producing a myometrial lymphangitis may cause menorrhagia and dysmenorrhœa. The cervical sphincter is an anatomical myth. The sterility of women with "conical cervix," "cervical flexion," or "pin-hole os," is *never* due to the cervical malformation as such, but to an existing endocervicitis.

These few quotations must suffice to hint at the interest in store for the reader and to indicate that the book deserves a warm reception from the profession.

IN his *Atlas of Operative Gynæcology*[2] Hirst has erected a monument to himself and to American gynecology. It is an unusual work—unusual both as to its exterior and its contents. It represents a record of the life work of a man with an exceptionally wide experience. The introductory chapter on equipment and preparation for gynecological operations contains the design of the new operating pavilion in which the author carries on his teaching. The remainder of the book is devoted to the technique of operations, and the author confines himself strictly to the conditions peculiar to women, leaving the operations common to both sexes to the general surgeon who is more competent to deal with them. The instruction given is chiefly by means of 164 large plates and 46 figures, and the accompanying text has been condensed so as not to detract from the pictorial character of the work. Even in these days when we have become somewhat spoiled by excellent pictures, the illustrations in the *Atlas* are remarkable as to their size, their clearness and accuracy, and anyone with previous operative experience who wishes to adopt Hirst's technique, will find it an easy matter to carry out the steps of the procedures advocated. The author hopes that

[1] Gynoplastic Technology. By Arnold Sturmdorf, M.D. Philadelphia: F. A. Davis Company, 1919.

[2] Atlas of Operative Gynæcology. By Barton Cooke Hirst, M.D. Philadelphia and London: J. P. Lippincott Company, 1919.

even a tyro might learn from these pictures to acquire a correct technique. While this may be true, the desirability of such a purpose might well be argued. Is it not the trend of modern opinion that operative technique should be acquired by assisting at operations rather than from books?

The views expressed in the text are based on personal experiences of many years. The experiences of others are referred to only in so far as they have produced a reaction upon the author. This book, then, is essentially a *confessio medici*, and some of the opinions propounded are, therefore, open for discussion. But whether or no there are debatable points here and there, the reviewer has found keen delight in reading this book from cover to cover and he predicts a like experience for the many who will give this work its well-deserved attention.

The reviewer can not refrain from adducing, at random, at least a few selections. Hirst's plan of protection against wound infection is very elaborate. The evening before the operation, the abdomen is shaved, thoroughly cleansed for ten minutes with a 1 per cent lysol solution, and then with alcohol. This cleansing is repeated the next morning and finally a moist dressing of a 1 per cent formalin solution is applied. Upon the operating table, the line of incision is wiped with a 5 per cent solution of thymol in alcohol, the abdomen is incised, a piece of rubber dam is laid over the incision, then cut through over it, and after the incision has been completed, the edges of the peritoneum are sewed to the edges of the rubber dam. His choice of anæsthesia is nitrous oxide gas followed by the ether drop method. Other methods may be used occasionally, but spinal anæsthesia is tabooed. In fresh perineal or cervical tears, the author prefers to wait with the repair work until the fifth day after delivery, and he claims more uniform results for his method. The advice to stretch the torn sphincter before attempting to unite the edges, seems very valuable. Postpartum cystocele is usually due to a frank or concealed injury of the muscle and fascia of the urogenital trigonum, and therefore requires separate attention. In his interposition operation Hirst carefully resects the tubes in younger individuals; yet, he has observed pregnancy in three cases. In such women he, therefore, prefers the Goffe operation or a method of his own, but he very frankly admits a fairly large percentage of recurrences. In the much debated question as to the clinical dignity of retrodisplacements, he holds that symptomless cases are the exception and that the majority of patients require treatment, preferably of an operative nature. He has, by surgical means, even cured several cases of actual epilepsy associated with retroflexion. He favors a combination of an Alexander-Adams with a laparotomy through a Pfannenstiel incision, but whatever method he employs in a given case, he adds, as a safety measure, a temporary suspension of the uterus with a single catgut suture. He rejects the operations for anteflexion of the type of the Dudley or Reynolds procedures and likewise expresses himself opposed to vaginal hysterectomy for prolapse. On the other hand, he has found dilatation very useful in sterility and reports cure in 43 per cent. The results of dilatation can be made even more secure and lasting by employing electrolysis. The details of all the procedures mentioned must be read in the original or studied by his telling pictures. In the controversy of the removal of both tubes in ectopic pregnancy he takes the stand that the unaffected tube should be saved. In 167 tubal gestations, he observed a repeated ectopic only in seven cases, while thirty children were born in a natural way. In the last five years he has performed forty Wertheim-Bumm operations for cancer of the uterus with only three deaths, or 7½ per cent mortality—a most encouraging and inspiring result in this country.

There is no need for further details. Intensely individualistic though it is, the book compels admiration and stimulates discussion; and the publishers should come in for their share of the general appreciation with which this work will be accepted

NOT long ago the statistician for the Commonwealth of Australia, in a monograph on population, made a forecast of so colossal an increase in the world's population as to put a severe strain on the resources of Nature. That prediction probably has the distinction of being the only one of its kind. Long before the war, the authorities in almost all civilized countries were of a different opinion, and today every thinking person realizes the seriousness of the situation. The obstetricians have been among the first to suggest practical means to check further depopulation. Their particular aim is directed toward the greatest possible reduction of fœtal mortality, and from this standpoint, a booklet of barely a hundred pages, which has just arrived from abroad, claims our earnest attention. While this little brochure[1] deals primarily with conditions in Germany, it is applicable to any country.

The author has set himself the task of showing how the loss of children in labor may be prevented or at least reduced to a minimum. After estimating the percentage of fœtal mortality during labor and investigating, in a second chapter, the various causes of fœtal death, he proceeds to a discussion of the dangers to the child during the second stage of normal labor and the means of recognizing and combating these dangers. It may be said parenthetically that Benthin considers a second stage of more than two hours abnormal. If between contractions the fœtal heart beats remain below 100 or rise above 180, labor should be terminated at once. The following seven chapters deal with the means of saving the child's life in contracted pelvis, placenta prævia, eclampsia, and the various forms

[1] Die Erhaltung des Kindeslebens in der Geburt. By Prof. Dr. Walther Benthin. Berlin and Vienna: Urban und Schwarzenberg, 1919.

of pathological presentations. The proposed measures are based upon carefully compiled statistics and the large material of the university hospital in Koenigsberg where the author occupies a teaching position. He repeatedly refers to American statistics. The only omission found is this that the influence of narcosis upon fœtal mortality has not been taken into consideration.

His conclusions are briefly these: It lies in the power of the obstetrician to render the state an immediate service by protecting the child's life in labor. His chief object must be to preserve both mother *and* child. The interest of the mother is paramount, but that of the child has not always been equally safeguarded. Obstetrical technique is so highly developed nowadays that a way may always be found to do justice not only to the mother but to the child as well. An improvement of existing conditions may be expected from more frequent hospitalization of obstetrical cases and an elevation of the obstetrical *niveau* of the profession.

FORTUNATELY there are forces at work in our country to bring about this most desirable object. Our textbooks on obstetrics are particularly praiseworthy. The reviewer has several such before him.

De Lee's *Obstetrics*[1] is one of those textbooks that is a distinct asset to American medical science. Within five years it has appeared in three editions and numerous reprintings, an eloquent proof of its well-deserved popularity. In the present third edition the author has succeeded in incorporating even the latest Continental obstetric literature and thus has brought his book strictly up to date. It is safe to say that under the conditions of the war no other book has attained a like completeness. Comparatively few changes from the last edition were needed. The Abderhalden reaction, the relation of the endocrine glands to gestation, twilight sleep, and the urinary tests for the toxæmias of pregnancy required new evaluation. Other subjects, mainly of a practical nature, were amplified. Among these, the author's greater interest in the conservative treatment of eclampsia is particularly interesting. It is, however, not necessary to go into further details. A mere announcement of this work will suffice and will be welcomed by students and teachers both here and abroad.

THE subject of obstetrics from the standpoint of the operator finds a very able presentation in a new book by Leavitt.[2] The methods of dealing with the various pathologic conditions causing dystocia are presented in thirty-two chapters. In each, the indications for any given intervention are clearly stated; the preparations for, and the technique of, every procedure are succinctly set forth; any difficulties likely to be encountered, are pointed out, and the prognosis outlined. The scope of the book also includes topics which strictly speaking are not classified under the heading of dystocia, such as postpartum hæmorrhage, abortion, asphyxia of the newborn, and ectopic pregnancy. The views expressed conform with the best teachings of the day, and the large personal experience of the author has enabled him to place the emphasis on the proper points. Dwelling, for instance, on the necessity of waiting for sufficient dilatation of the cervix, or warning against undue force in forceps extractions are obstetrical aphorisms that cannot too often be reiterated. Commendable, too, is the advice to make an episiotomy a little too long rather than too short, lest it serve the undesirable purpose of being the starting point for an extensive tear. While operative obstetrics properly belongs in a hospital, the author does not lose sight of the exigencies of daily practice and supplies his readers with suggestions as to how to carry out the necessary procedures at the home of the patient. In the matter of anæsthesia, he is non-committal as to "twilight sleep." Spinal anæsthesia for the more severe lacerations seems to appeal to him though it is questionable whether many will accept this indication for spinal anæsthesia. In prolapse of the umbilical cord with the head still above the pelvic inlet, he prefers podalic version and extraction to cæsarean section; yet the latter procedure would seem the more rational as the condition mentioned is more likely to occur in a contracted pelvis.

The greatest obstacle, the beginner—and it is to him that the author addresses himself primarily—encounters in operative obstetrics, is the difficulty of appreciating dimensions without the guidance of the eye, and in this he will be greatly aided and comforted by the numerous and excellent illustrations. In short, the book represents safe and sane obstetrics and teachers should gladly recommend it to their students.

A COMPENDIUM of pathological and operative obstetrics which, within a small compass, covers an amazingly large ground, has recently been published by McNeile.[3] As a means of review and as a summary of more extensive reading, the student will find this booklet of immense value. The practitioner, too, would do well to slip it into his pocket and consult it while "on a case." The tenor of the book with its clear-cut instructions is such as to engender an "obstetric conscience" and to increase a due regard for the welfare of the unborn child. These *Notes* will occupy a useful niche in the book-world.

[1] THE PRINCIPLES AND PRACTICE OF OBSTETRICS. By Joseph B. DeLee, A.M., M.D. Philadelphia and London: W. B. Saunders Company, 3d ed., 1918.

[2] THE OPERATIONS OF OBSTETRICS EMBRACING THE SURGICAL PROCEDURES AND MANAGEMENT OF MORE SERIOUS COMPLICATIONS. By Frederick Elmer Leavitt, M.D. St. Louis: C. V. Mosby Company, 1919.

[3] NOTES ON PATHOLOGICAL AND OPERATIVE OBSTETRICS. By Lyle G. McNeile, M.D. Los Angeles: The Division of Obstetrics, College of Physicians and Surgeons, Medical Department of the University of Southern California, 1919.

BOOKS RECEIVED

Books received are acknowledged in this department and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

A GUIDE TO GYNÆCOLOGY IN GENERAL PRACTICE. By Comyns Berkeley, M. A., M. D., M. C. (Cantab.), F.R.C.P (Eng.), and Victor Bonney, M.S., M.D., B.Sc. (Lond.), M.R.C.P. (Lond.). London: Oxford University Press, 1919.

THE NARCOTIC DRUG PROBLEM. By Ernest S. Bishop, M.D., F.A.C.P. New York: The Macmillan Company, 1920.

MODERN SURGERY, GENERAL AND OPERATIVE. By John Chalmers DaCosta, M.D., LL.D., F.A.C.S. 8th ed. revised and enlarged. Philadelphia and London: W. B. Saunders Company, 1919.

THE DISEASES OF INFANTS AND CHILDREN. By J. P. Crozer Griffith, M.D., Ph.D. 2 vols. Philadelphia and London: W. B. Saunders Company, 1919.

ORTHOPEDIC AND RECONSTRUCTION SURGERY, INDUSTRIAL AND CIVILIAN. By Fred H. Albee, A.B., M.D., D.Sc., F.A.C.S., Lieutenant Colonel M.C., U.S.A. Philadelphia and London: W. B. Saunders Company, 1919.

HERMAN'S DIFFICULT LABOUR; A GUIDE FOR STUDENTS AND PRACTITIONERS. 6th ed. revised and enlarged. By Carlton Oldfield, M.D. (Lond.), F.R.C.S. (Eng.). London: Cassell and Company, Ltd., 1920.

THE NOSE, PARANASAL SINUSES, NASOLACRIMAL PASSAGEWAYS, AND OLFACTORY ORGAN IN MAN. A GENETIC DEVELOPMENTAL, AND ANATOMICOPHYSIOLOGICAL CONSIDERATION. By J. Parsons Schaeffer, A.M., M.D., Ph.D. Philadelphia: P. Blakiston's Son & Co., 1920.

THE AFTER-TREATMENT OF SURGICAL PATIENTS. By Willard Bartlett, A.M., M.D., F.A.C.S. and collaborators. 2 vols. St. Louis: C. V. Mosby Company, 1920.

SUITES DE COUCHES NORMALES ET PATHOLOGIQUES. By E. A. René de Cotret. Montreal: Librairie Deom Frere, 1919.

FOOD FOR THE SICK AND WELL; HOW TO SELECT IT AND HOW TO COOK IT. By Margaret J. Thompson, R. N. Yonkers-on-Hudson, New York: World Book Company, 1920.

SYPHILIS. A TREATISE ON ETIOLOGY, PATHOLOGY, DIAGNOSIS, PROGNOSIS, PROPHYLAXIS, AND TREATMENT. By Henry H. Hazen, A.B., M.D., St. Louis: C. V. Mosby Company, 1919.

THE MEDICAL ASPECTS OF MUSTARD GAS POISONING. By Alfred Scott Warthin, Ph.D., M.D., and Carl Vernon Weller, M.S., M.D. St. Louis: C. V. Mosby Company, 1919.

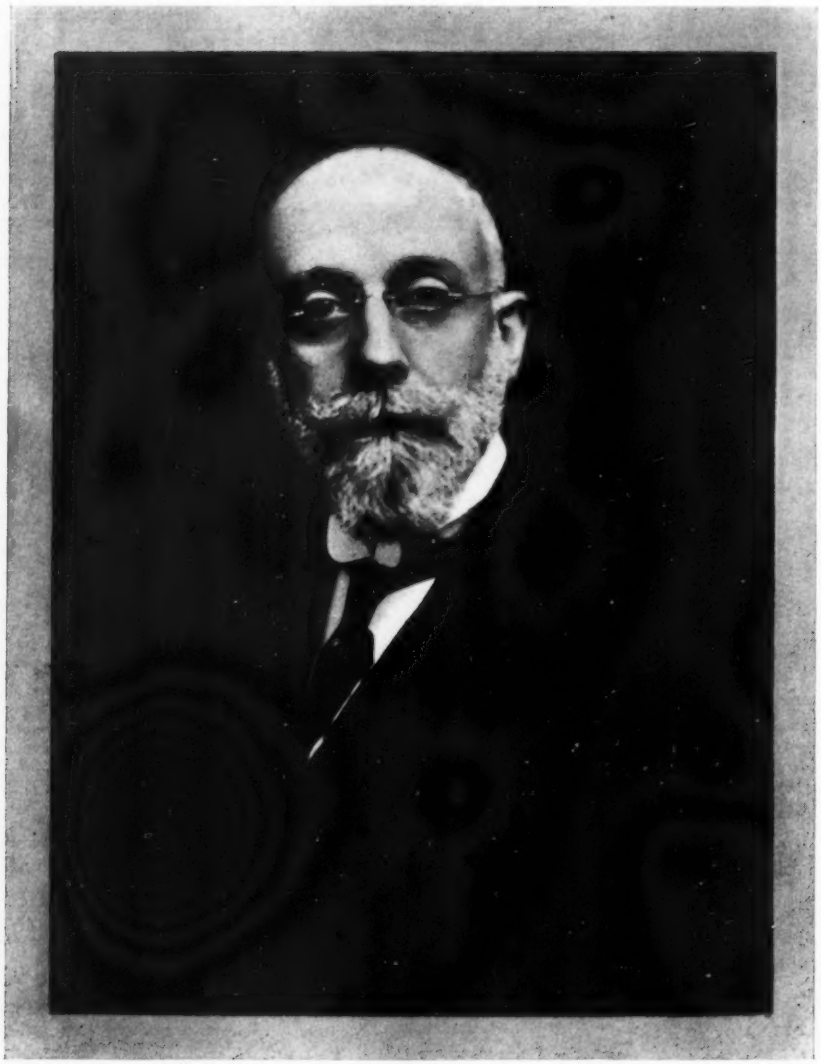
THE WOMAN OF FORTY. By Dr. E. B. Lowry. Chicago: Forbes & Co., 1919.

A TEXTBOOK OF GYNÆCOLOGICAL SURGERY. By Comyns Berkeley, M.A., M.C., M.D. (Cantab.), F.R.C.P. (Lond.), M.R.C.S. (Eng.), M.R.C.P. (Lond.). 2d ed. London: Cassell & Co., Ltd., 1920.

RAMBLING RECOLLECTIONS; AN AUTOBIOGRAPHY. By A. D. Rockwell, M.D. New York: Paul B. Hoeber, 1920.

INJURIES TO THE HEAD AND NECK. By H. Lawson Whale, M.D. (Camb.), F.R.C.S. (Eng.), with preface by Colonel Frederick F. Burghard, C.B., M.D., M.S., F.R.C.S. New York: Paul B. Hoeber, 1920.

PHYSICAL RECONSTRUCTION AND ORTHOPEDICS. By Harry Eaton Stewart, M.D., New York: Paul B. Hoeber, 1920.



DR. MARCELINO HERRERA VEGAS

Professor of Surgery and Dean of the Faculty of Medicine, University of Buenos Aires.

AMERICAN COLLEGE OF SURGEONS

SOUTH AMERICAN SURGEONS

Official Visit to Peru, Chile, Argentine, and Uruguay in Behalf of the American College of Surgeons, by Dr. William J. Mayo, President, and Dr. Franklin H. Martin, Secretary-General

By FRANKLIN H. MARTIN, M.D., F.A.C.S.

I. INTRODUCTORY

SINCE the inception of the American College of Surgeons, its organizers have had in mind that the College should become comprehensively American, eventually including in its Fellowship all worthy surgeons of the American continents.

During 1914 and 1915 a preliminary correspondence with the surgeons of South America was entered into by the office of the College, under the guidance of a special Spanish-speaking secretary, who conducted the correspondence in Spanish. This was undertaken as a precursor of a visit that was to be made in the winter of 1915–1916. The European War, which was threatening the usefulness and safety of the shipping routes of the Western Hemisphere, coupled with our own interest in the conflict, compelled us to postpone further thought of an immediate visit to the southern continent.

Upon the signing of the armistice, it became apparent that, with the educational institutions of Europe disorganized and European travel discouraged, this time was particularly opportune for the revival of our plans to visit the surgeons of the various countries of our own South America.

The suggestion came almost simultaneously from our President, Dr. W. J. Mayo, and other members of the Board of Regents of the College, and with an assurance on the part of the President that he personally would make the trip, our correspondence was hurriedly revived, travel arrangements promptly made, and January 7 set as the time for our departure.

On December 20, the Secretary-General laid the tentative plans before the Board of Regents, and they were received with hearty approval. As a preliminary, committees of surgeons in Peru, Chile, Argentine, and Uruguay were selected, and we communicated to the individual members of each committee the object of our contemplated visit, informing them at the same time of the approximate time of our arrival. The following extract from this correspondence will reveal more definitely our plans:

> . . . The principal object of our tour is to enlist the interest of the surgical profession of your countries in the American College of Surgeons, with the idea of ultimately extending to the surgeons of South America an invitation to become Fellows of the College. . . . Could you arrange to have a small group of from five to ten of your surgeons meet with us at the time of our visit to discuss our problem? Fellowship in the American College of Surgeons is open to all general surgeons and surgical specialists. . . . Therefore, in selecting the group for the preliminary conference, you may take into consideration these specialties. . . .
>
> At our conference we would suggest that the following matters should be considered:
>
> "1. As a means of promoting a closer affiliation between the professions of the South and North American continents, will the surgeons of your country desire to become Fellows of the American College of Surgeons on an equal basis with the surgeons of North America?
>
> "2. Should you favor such affiliation, will you have prepared in advance and furnish to us at our conference a carefully selected list of the eminent surgeons of your country who, because of their standing in the profession, should be recommended for Fellowship in the College without examination?
>
> "3. Will you be prepared to suggest to us at the conference a plan that will aid in bringing about a closer relationship between the surgeons of your country and the surgeons of the United States and Canada?"
>
> In order that you may become familiar with the organization of the American College of Surgeons and may have some knowledge of the personnel of its officers and Fellows, we are mailing you a copy of our directory. . . .

Upon viséing our passports, the several South American consuls imparted to their respective ambassadors in Washington information in reference to our contemplated visit. The Pan American Union in Washington secured facts regarding our plans and proceeded to make the occasion the subject of diplomatic correspondence.

NOTE.—The illustrations intended for use with this article were delayed in the mails, and will appear later in another article.

Before leaving New York, the president and secretary-general of the College received letters from Mr. Lansing, Secretary of State, commending our proposed trip and informing us that he had communicated concerning the subject with the United States ambassadors in the capitals of the countries included in our itinerary.

Letters were also received from the ambassadors to the United States from Peru, Chile, Argentine, and Uruguay, stating that they had cabled to their respective governments the facts concerning our contemplated mission.

On January 7 the president and the secretary-general of the College, with their wives, sailed from New York on the S.S. "Ebro," an 8,000-ton steel ship flying the British flag. The itinerary included Jamaica, Panama, Peru, Chile, Argentine, and Uruguay.

From the standpoint of the surgeon, the trip had interest in the medical schools, the hospitals, and the operating surgeons of the four countries of this southern continent that we were privileged to visit. The short time at our disposal and the difficulties of transportation made it impossible for us to include Brazil and the several other South American countries. However, visits to these countries will be undertaken as soon as proper arrangements can be made. This trip, undertaken as a purely professional one in behalf of the American College of Surgeons, cannot be properly described without relating some of the unusual personal experiences we enjoyed.

II. THE VOYAGE

It is an ordinary experience to board an ocean liner and be deposited in one week in Liverpool or Cherbourg. It is, however, an *unusual* experience for a North American to board a commodious steamer for a long sea voyage of six weeks to our southern continent. Especially is it unusual when one leaves Rochester, Minnesota, and Chicago in January, with the temperature ranging from zero to ten degrees below, with the necessity for winter garments, and finds oneself three days out of New York in the warm Gulf Stream, with the tropics in anticipation, and summer clothing in demand.

We sailed from New York on January 7, and anchored in Valparaiso harbor on February 1. With a few intervening stops at interesting ports, this represented the first arm of the sea voyage which may be summarized by the one word "ideal." At no time was there a sea of sufficient roughness to cause one the slightest discomfort. The sun shone almost continuously, and there was but one rainfall, and that in the small hours of the morning when the ship's voyagers were asleep. After passing Cape Hatteras the temperature on shore or ship was at no time above 85° F. or lower than 50°. It was possible to sit on deck at all times with light wraps or none at all, and, fanned by a cool breeze that was always present, read a book, dream over a cigar, or while away the time enjoying the companionship of old friends or those newly made, and at any time supply the inner man with the good things which were afforded by the well-equipped ship which was sailing a sea that was always "wet." The climate for six long weeks was like the most perfect June day in Chicago, when a gentle breeze is blowing from off the lake. Considering these ideal weather conditions, and our splendid boat with canvas canopies over the broad decks, with much space in which to exercise, with comfortable chairs, with music in the lounge, with a well-stocked smoking room, with salt and fresh baths, with a swimming pool, and, to cap all, with comfortable beds and the unusual, clean, plain table of a well-conducted English ship, supplemented by strange fruits from tropical parts, one would have to be especially difficult to please if he could not find here contentment and satisfaction. It must become the overworked and the tired man's paradise.

III. THE CONTINENT

The *Conquest of Peru* has left in the minds of civilization a romantic impression of South America which fits well one's imagination during a visit to the whole continent. I believe one of the great charms of South America lies in its barren shore line and the occasional oasis in the form of an important seaport. From Panama, where the second break of the trip occurs, Kingston being the first, there is a two days' sail due south without a sight of land, and on the third day one comes abreast of the great promontory of Equador, and from there to Valparaiso he is in constant sight of the dry, brown coast range of mountains, with an occasional glimpse of the snow-capped second and more important range. The first stop south of Panama was at the port for Lima—Callao. The Pacific is so undisturbed and calm that the ships anchor in the open sea and transport their passengers to the dock by row boats or little launches, loading and discharging their cargoes from lighters. Eight miles from Callao, which is a flat little seaport town of about four thousand inhabitants, and connected with it by a broad boulevard and by trolley, is the capital of Peru—Lima. This city and its seaport

are typical of all seaport towns on the western coast, as far south as Valparaiso. The mountains surrounding the coast are absolutely barren of foliage; rain is almost unknown; and the sun-dried mountains have crumbled, and everywhere at their base, except where the sea washes, is a long, straight line of deep brown dust that constantly sifts down from above.

Lima is typical of the nearby inland cities. They are always the source of water supply and are real oases in sterile rock, mountain-bound valleys. These valleys "bloom like the rose" as soon as water is turned into them. Growing in the dust-covered earth are royal palms, fruit-bearing trees of all kinds, and a wealth of foliage and tropical flowers. Every house has its patio and each is the central attraction of the habitation. And so with Arica and its inland oasis city—Tacna; also Antofagasta, Valparaiso, and Santiago.

From Valparaiso we traversed the continent and landed at the metropolis of South America—Buenos Aires, and made the last reach by viewing the Atlantic Ocean at Montevideo. It is no small experience for the traveler who is familiar with the Trans-Andean route to make it again and again, and how much more eventful it is for one traversing it for the first time. An unusual ride from the scenic standpoint is the first arm of the journey to Los Andes, Chile, an oasis city. The climax is reached, however, in the climb by cog railroad to the top of the Andes, penetrating by a two-mile tunnel a lofty final obstruction, the road reaching a height of 10,470 feet, with the highest peaks of the two continents towering in grandeur, snow-capped, far above the dizzy height. Then the descent on the Argentine side to Mendoza, the center of the grape-growing province. Finally, one enters a special train of sleepers and diners on the broad gauge road, which takes the traveler across the broad pampas, which are covered with a wealth of wheat, corn, and grazing cattle and sheep, and conveys him to Buenos Aires. An overnight ride on a comfortable steamer of palatial equipment completes the trip to Montevideo.

In this continental journey one traverses two proud republics and enters a third. In crossing the first, Chile, he enters two cities of importance and travels among the foothills of a mighty mountain range, with deep valleys and raging torrents of rivers, and appreciates the interest that is excited by a new civilization in a strange land, and all the picturesqueness of an Alpine scene. This develops finally into the grandeur of the Canadian Rockies, as one crosses the divide, and there is revealed Aconcagua, the premier peak of the continent, with its worthy satellites. Then one begins the descent, picking one's way over almost impossible abysses on a roadbed that is the pride of engineers of international fame; and at last a great empire of agriculture that reminds one of the plains of the Dakotas, Montana, Minnesota, and Illinois, arriving at a metropolis that brings to mind Rome and Paris rolled into one, which houses a people who are proud of their great country and know how to welcome the stranger.

IV. OUR WELCOME

We did not have to wait until we reached South America to feel the warm handclasp of welcome. Standing on the dock at Colon was our friend, and the official Sanitary Officer of the Canal Zone, Colonel H. C. Fisher. We last knew him in the Surgeon General's office in Washington during the strenuous days of the war. He was in uniform, appearing almost boyish in his white helmet, and his face was good to look upon. We dined with him that evening, together with our wives, meeting at dinner other friends of war time—Colonel Greenleaf, Sanitary Officer of Panama; and Colonel Hess, in charge of the Government Hospital at Balboa. Afterward at a reception we met the principal members of the medical fraternity of this little Republic. We were particularly interested in the inspection of the City of Panama the next day, under the guidance of Dr. Braithwaite.

On anchoring at Callao, the port for Lima, our ship was soon besieged by launches, and in one of the first was Antonio Grana, Esq., a business man of Lima, who came to pay his respects to Dr. Mayo. His launch was followed by another with a group of Lima surgeons, representing the Sociedad de Cirugía del Perú. We were informed by Drs. Aljovin, Grana, Gastaneta, Denegri, and Macedo of the committee that we were to take automobiles from Callao to Lima, and become the guests of the Society at the Hotel Maury during our three days' stay at Lima. The eight-mile trip by motor along the sea boulevard was most enjoyable, as it gave us the first shore glimpse of this rainless country. Our days were full, the intervals between conducting the business of our mission being crowded by hospitable attentions which were accorded to us by the surgeons of Lima and Callao, the government of Peru, and our own United States representatives residing there. Before disembarking, we were welcomed by our American Consul and the Chargé d'Affaires, representing the American

Embassy, who bore invitations for us to visit the Minister of Foreign Affairs and the President of the Republic that afternoon. Dr. Guillermo Gastaneta was our host at luncheon at the Botanical Gardens that day, and a group of surgeons of Lima were additional guests.

At four o'clock, Mr. William Walker Smith, the Chargé d'Affaires, visited us and we made official calls upon the Minister of Foreign Affairs, and afterward on the President of the Republic. The palace of the President was built by Pizarro in about 1540, and occupied by him as his official residence. While waiting we were shown the spot where Pizarro was assassinated, and were then conducted by relays of red-coated officials to the executive apartments. There we were met by the secretary, who took us into the audience chamber where the President greeted us. He is an attractive, vivacious man of rather small stature who speaks English perfectly, and we were soon engaged in an animated discussion of our mutual friend, Major General William C. Gorgas. The President reminded me of our own Secretary of War, Mr. Baker—the same keen, intellectual type of man.

That evening Dr. Juvenal Denegri, president of the surgical society, gave an official dinner that was attended by about sixty men and women. This was an elaborate banquet given at the Botanical Gardens, and it was an affair that emphasized the exquisite taste of these delightful people. An address directed to the President of the College, Dr. Mayo, was read by Dr. Denegri. Dr. Mayo formally responded. This occasion added to the cordiality of our reception and stamped it as official. The next day we, together with the ladies of our party, were entertained by Professor Miguel C. Aljovin at a luncheon at his home, the first luncheon in which an attempt was made to give us Peruvian dishes exclusively. The dining room opened onto a patio filled with flowers, growing palms, and cages of highly-colored birds who vied with a native mandolin orchestra playing Peruvian airs. Here we succeeded in getting the home atmosphere of the people of Lima. The next day Dr. Denegri entertained us at luncheon at the Union Club, and in the evening we were the guests of Antonio Grana, Esq., at a dinner at his interesting residence. In the afternoon we attended a garden party at the American Embassy given by Mr. and Mrs. William Walker Smith. There are many memories that will frequently hark back to our visit in Lima. The unobtrusive but continuous hospitality of these people, with their cosmopolitan ways and cultivated minds, is something that we can never forget. Our welcome was not by any means wholly official, as there was much that was personal, because of the affection that many Peruvians have for our chief, Dr. Mayo. Not until we had been deposited on our ship, loaded with fruits and other dainties, and our adieus had been said, did we realize to the full the friendships that we had made.

And this was but the beginning of entertainments that continued wherever we touched the continent, and at all times on our land trips. Even at the small ports we were greeted by officials and physicians. At Arica we had been prepared by a wireless from our American Consul to meet the Governor of the Province, the *intendente*, Mr. Edwards, of Tacna. At Arica a special coach awaited us, consisting of an enclosed body built on a Ford auto, with flanged wheels that traversed the railroad. We were conveyed to it by the Consul, Mr. Cameron; the Governor; and Dr. Tomes Aravena, of Arica. The invitation included Dr. and Mrs. Mayo, and Dr. and Mrs. Martin. On arriving at Tacna we were greeted by Mr. Edwards, the *intendente*, Mr. Eliot, the English Consul, and two physicians. Our luncheon in the palace of the *intendente*, with his wife, four daughters and a son, and guests, was one of the most interesting experiences of our trip. We viewed the beautiful gardens afterward, and then were taken by Mr. Eliot to inspect a new hospital of which he has every reason to be proud. This city of Tacna is thirty miles from the sea, at an altitude of 1,800 feet, and is an oasis with a population of ten thousand.

At Antofagasta and Iquique we were carefully looked after, at the latter port by Dr. J. E. Villalon Diaz and Dr. Germán Aliago, both local surgeons of renown; and at the former city, Antofagasta, by Dr. W. F. Shaw, an American stationed at the copper mines at Chuquicamata, the captain of the post, and Dr. A. Arturo Pemjean. We were shown the clean city, inspected a hospital and were entertained at luncheon in a large public garden.

At Valparaiso the first launch brought a distinguished group of men who had come to greet us, pay their respects, and take us to the dock. They were lined up and we were introduced to Dr. Edwyn P. Reed; Dr. Vincenti Daguino, Viña del Mar, president of the medical society of Valparaiso; Dr. Gaston Lachaise, secretary of the medical society of Valparaiso; Dr. R. de la Fuente, Dr. Alberto Adriasola, and Dr. Prain, of Valparaiso; Professor Correo Pardo, Professor José Ducci, Dr. Luis Vargas, and Dr. Juan de Diaz, of Santiago. Our stay at this port was short,

but we visited the town, and before taking our Trans-Andean train at noon we had refreshments at the Naval Club with Dr. Adriasola, Surgeon General of the Chilean Navy, as our host. In ten days we returned to this city in the special Pullman that the government had furnished us and were literally carried away by the committee of surgeons which had greeted us on our arrival in port.

At Viña del Mar, a suburb of Valparaiso, they intercepted us and conveyed us in automobiles to a tropical garden where, in the shade of enormous trees, a wonderful banquet table was spread. A large oval canopy was stretched overhead, and in the background were the American, English, and Chilean flags. The entertainers were headed by Dr. Vincenti Daguino, who made us a formal address which was responded to briefly by Dr. Mayo, Dr. Martin, Dr. Reed, Dr. Muenich, Dr. Avarosus, and Dr. Adriasola. Then our hospitable friends conducted us to our dock and by special launch took us to our ship which had been awaiting us for two weeks.

At Buenos Aires we were greeted both officially and medically. Reporters boarded our train about an hour out of the city. On alighting at the station we were immediately greeted by Mr. Welles, representing the American Ambassador, who formally conveyed that official's greetings to us. Then appeared a delegation of doctors from the Faculty of Medicine. General introductions were indulged in. Heading the group were Dr. Marcelino Herrera Vegas, Dr. Marcelo T. Vinas, Dr. Pedro Chutro, and Dr. José Arce. After much flashlight photographing on the part of a battery of newspaper men, we were conveyed to the Plaza. There for two hours in the corridor of the hotel we held an informal reception and met many of the physicians and surgeons of Buenos Aires.

There was much for us to see and accomplish in this metropolis, and our professional and official social entertainments were many and most interesting. The first day after inspecting hospitals we were "breakfasted" at the Jockey Club, where we were especially distinguished by having large goblets of actual ice water served in honor of Dr. Mayo. The luncheon was much appreciated as our hosts had been our guides during the morning. The Jockey Club is the pride of this city, and is not surpassed anywhere. It reminded us of Paris, New York, or London.

At noon we paid our respects to the American Ambassador, Mr. Frederic Jesup Stimson, a Boston man of the type of Senator Lodge, but much younger. Our greeting was most cordial and we had an enjoyable call, conducted without interpreters. We were invited to tea for Sunday afternoon.

Dr. Chutro took us on a unique trip in the afternoon to El Tigre. This is a freak of nature of LaPlata which converts a large area of land adjacent to it into many islands by offshoots which resemble artificial canals. These islands are covered with summer residences and luxuriant fruit orchards.

Saturday was enjoyed with an excursion by automobile as guests of Dr. Vegas to his *hacienda*, or landed estate. It consists of forty-five square miles of agricultural territory lying about half way between Buenos Aires and LaPlata. We were accompanied by Dr. Cranwell and his daughter, and Dr. Pasman and his brother. This is one of the largest and most attractive landed estates in Argentine. This day's visit to Dr. Vegas' estate, which is one of the side interests of this remarkable surgeon, is worthy of a separate chapter. However, our day was not completed until we motored on to LaPlata. On the way we could fix in our minds a few commercial facts regarding this estate, on which there are one hundred thousand cattle, two hundred thousand sheep, and other animals in proportion, and on which is raised quantities of grain, corn, and produce.

On reaching LaPlata we were the guests of the president of the Universidad Normal de La Plata. We breakfasted in one of the corridors of the University. The professor of anatomy, Dr. Pedro Belou, made an address in Spanish, to which we responded in English. We were then driven about the beautiful but deserted city of LaPlata and returned to Buenos Aires by motor. It was a distinguished group that we met that evening at dinner at the American Embassy. One of the interesting men we met on this occasion was the *intendente* of Buenos Aires. On Sunday another estate was visited by Dr. and Mrs. Mayo and Mrs. Martin as the guests of Dr. Pasman and Dr. Cranwell. They were entertained at luncheon, and then taken to the races, which are the most attractive Sunday diversion of these people. Later they took tea at the American Embassy.

Montevideo welcomed us with open arms. A letter from our Ambassador, Mr. Robert Jeffery, in Montevideo, to our Ambassador in Buenos Aires had given us advance information to the effect that a committee from the Faculty of Medicine would welcome us. Accordingly, when the gang plank of our steamer connected us with the dock at Montevideo, the first to

come over it was a committee headed by the Ambassador, Mr. Jeffery. The committee of surgeons and physicians consisted of Dr. Enrique Pouey, Dr. Gerardo Arrizabalaga, Dr. Horacio Garcia Lagos (who speaks English fluently), Dr. Alfredo Navarro, Dr. A. Ricaldoni, dean of the Faculty of Medicine, Dr. Lorenzo, Dr. Carlos A. Belliure, Dr. Alfonso Lamas, and Dr. Julio Nin y Silva. General introductions were in order, after which we filed onto the upper deck and were duly photographed by newspaper men.

We were then driven to Montevideo where we inspected the medical school, accompanied by about seventy-five members of the faculty and students. Later we drove about the city and were shown with pride the new sea boulevard which is named for President Wilson. After transacting some business, we were taken to the Parque Hotel where we lunched with a group of government officials and medical men. The luncheon was an elaborate one served in the great dining room of the hotel, in which a large number of other people were being served, including a luncheon party given by Mrs. Jeffery for the ladies of our party. At the end of the feast the president of the faculty read an address to the guests which was translated into English by Dr. Ernesto Dowling. Dr. Mayo responded, followed by Dr. Martin. These two talks were, in turn, translated into Spanish. Mr. Jeffery arranged an interview for us with the Minister of Foreign Affairs in the afternoon. We were very graciously received, and the Minister expressed genuine good will toward our country. He reminded us that Uruguay had followed us into the great war because Uruguay looks upon the United States as its protector against foreign aggression, and when the United States feels compelled to enter European wars, Uruguay automatically follows. Hence she broke diplomatic relations with Germany immediately after our declaration of war. He regretted very much that the President of the Republic was away for the day, and he conveyed to us the President's regrets. The importance of our visit from the point of view of the government may be judged by the fact that this Minister, corresponding to our Secretary of War, was at the ship that night to see us off. Greater cordiality than we received could not have been extended to anyone in the short time we had to spend in Montevideo.

The next morning we were met by many of our friends at Buenos Aires, in spite of the fact that we had but a few minutes to spend in transferring from the Montevideo boat to our transcontinental train. We arrived in Los Andes, Chile, the following evening. At this point we were to change from the narrow gauge Andean train to the normal gauge Chilean train. The Governor called to inform us that he had instructions from his government in Santiago to look after our comfort and to attach to our train a special Pullman coach for the use of our party while in Chile. He then introduced us to the transportation chief who he said would accompany us. This was most welcome news as our party was much fatigued after the exciting journey. Fortunately the coach accommodated more than our immediate party, and we shared it with our other American fellow travelers.

At nine o'clock the next morning we were met at the Hotel Savoy in Santiago by a committee of local surgeons. Heading the delegation were Professor Gregorio Amunategui, Dr. José Ducci, secretary of the Faculty of Medicine, Dr. Correa Pardo, Dr. Victor Koerner, Dr. Francisco Navarro, and Dr. Jerman Valenzuela. We were whisked off to an inspection of hospitals and medical schools and ended up at the home of Professor Amunategui for a luncheon which was given by himself and his wife for our ladies and a number of medical men, including also our Ambassador, Mr. Joseph H. Shea. This was another enjoyable luncheon of the formal type that was made unusually pleasant by its family character. Dr. Amunategui is another of the cultured type of Spanish gentleman that wins one's heart by his genial hospitality and his genuine cordiality. In the evening the members of the Faculty of Medicine and their wives gave a large dinner for us in the restaurant on the famous island mountain, Cerro de Santa Lucia. This was a fitting finish for our official visit to this capital.

The next day we boarded our special train and were accompanied to Valparaiso by a brother of Dr. Lucas Sierra, the latter being in Europe, and Dr. José Ducci. We said goodbye to our friends who had gathered at the station to see us off and started for the coast. The final curtain was rung down on our entertainments when we again reached Lima on our return. A wireless had been received by us asking that we become the guests at a luncheon at a seaside resort between Callao and Lima, and witness a bull fight the following day, Sunday and Washington's birthday. We felt that this would be a fitting climax to a continental trip of two surgeons.

The pace had been a fast one. We reached Lima on January 22. Our official visit to South America, occupying just one month, was ended.

From our previous landing here until our escort left us at six o'clock on February 22, we had been in the hands of committees, civil and governmental, that had kindly but persistently entertained us. We had visited Lima, Santiago, Valparaiso, Buenos Aires, and Montevideo, and had crossed the continent twice from ocean to ocean. No company or commission has ever been entertained more royally, more dignifiedly, or more hospitably. At every station we were shown attentions that indicated that our own government had neglected no opportunity to impress upon our hosts the importance of our mission, and the governments of the countries that we visited were not slow in responding. Mr. William Walker Smith at Lima, Mr. Joseph H. Shea at Santiago, Mr. Frederic Jesup Stimson at Buenos Aires, and Mr. Robert Jeffery at Montevideo, our ambassadors and envoys, had neglected nothing which emphasized the importance of our visit. And, best of all, what can we say of the entertainment that we received from the surgeons of South America on our own account? It has been a proud month to the writer of this sketch to see our president and chief, Dr. Mayo, honored everywhere and always. No conquering hero has ever been accorded more royal treatment. "Mayo" has become a household word in four countries where before it was only known by reputation. This visit we hope will be the foundation for the establishment of a more personal friendship between the professions of our two continents.

V. MEDICAL SCHOOLS

We visited medical schools connected with the national universities at Lima, Santiago, Buenos Aires, and Montevideo. A primary, high-school, and university education is required by the medical schools for the admission of students. Peru, Chile, and Argentine require a seven-year course of medicine, while Uruguay requires but six. So far as we could judge them in our cursory visit, the physical properties of each of these four schools were adequate and modern in every detail. Judging from the provision for free hospital beds in so many of the hospitals of the cities in which the schools are situated, which are under the control of the faculties, the clinical material should be abundant. The laws of each of the governments provide for a reasonable distribution of dissecting materials, and postmortems are an accepted requirement. Our opportunity for meeting a strong group of each faculty was most favorable, and if the faculty as a whole approaches in point of ability the members with whom we became acquainted, the faculties are exceptionally strong. While it was vacation time and the medical schools were not operating at full capacity, we had an opportunity of observing and meeting a large number of students and a larger number of recent graduates who were serving as internes in the hospitals, and I am sure we were agreed that in appearance they compared favorably with those of the United States, Canada, and England.

The leaders of the faculties are men who have supplemented their home training by study in France, Germany, or other foreign countries, while a few have been in the United States. One cannot but realize that these medical schools are built on sound, fundamental bases. However, it was not possible for us in a short visit during the summer vacation season to judge of their present teaching value.

VI. HOSPITALS

The hospitals in South America, not unlike the hospitals in other civilized portions of the world, may be divided into several classes. One of the objects of our trip was to obtain a bird's-eye view of the hospitals in the cities we visited. We passed through, very hurriedly of course, a number of the principal hospitals in each of the capitals, and Valparaiso and a few other cities. With only minor exceptions, they all had suitable buildings and interiors, and opened onto extensive and attractive gardens or patios. Without exception, I believe all of them have a system of case records, and the average of completeness in this respect was above that found in the United States. Everywhere working laboratories, including X-ray outfits, were in evidence and were pointed to with pride. The operating rooms, with but few exceptions, were modern, and contained the most approved sterilizing apparatus. Conveniences for diagnostic purposes, and instruments for operating rooms were in abundance. Nearly all had provision for postmortems, and up-to-date morgues. The provision for graduate internes seemed to be adequate, especially in those hospitals connected with teaching institutions. Nearly all of the large hospitals had rather complete out-door dispensary departments. Some of the hospitals were deficient in modern plumbing. However, a large percentage of the important hospitals were elaborately equipped with these conveniences. Some had the most approved hydrotherapeutic departments, and modern laundries and kitchens were in evidence in nearly all of the larger institutions. The hospitals which did not have the

full equipment as enumerated above were not a few, but nearly all of these are in line for a rapid readjustment. Especially is this true since their teachers are thoroughly alive to the requirements of a modern hospital.

Two defects which were evident in nearly all of the hospitals visited and which appealed to us as rather easy to remedy were the lack of screening against flies, mosquitoes, and other insects, and a well organized system of nursing. The former of these will soon be remedied, and the latter is a difficult problem with which the faculties are wrestling. It was not a defect pointed out by us, but was freely admitted by our hosts.

The Modelo Instituto Clinica in Buenos Aires may well be taken as a model for all hospitals built in a climate such as Argentine's. It is one of the most beautiful from the standpoint of architecture and grounds, and its equipment, as far as we could judge, with the exception of the nursing organization, is complete in every detail. It was built as a model by the government of Argentine, and is maintained as such, which fact evidences the yearning of the people and the profession of this country for the best that can be devised. This hospital is also completely screened.

VII. THE SURGEONS

Peru. The Sociedad de Cirugia del Peru is of recent origin, and was established along the lines of the successful societies of the United States and Europe. The organizers have had the courage of their convictions, and have carefully selected their members. They have built themselves an attractive home in which to meet, to house their literature, and to entertain the stranger. The membership is limited to surgical specialists, and its members do not yet number twenty.

Nowhere in the world, I am sure, can the modern surgeon find himself more at home than among the surgeons of Peru; they are all men of the highest type; they are educated and possess the culture that comes from travel and study abroad, and they are conversant with at least one language besides their own. Nearly all of them speak French, a large percentage some English, and many of them converse with ease in the English tongue.

When we consider the personnel of these hosts of ours immediately come to mind the following: Dr. Miguel C. Aljovin, surgeon of the Maison de Santé, honorary member of the Faculty of Medicine; Dr. Constantino J. Carvallo, professor of descriptive anatomy; Dr. Juvenal Denegri, professor of otology, rhinology and laryngology, surgeon to Santa Ana Hospital; Dr. Guillermo Gastaneta, professor of clinical surgery, surgeon to Dos de Mayo Hospital; Dr. Francisco Grana, professor of surgical pathology, surgeon to Guadalupe Hospital; Dr. Carlos Morales Macedo, professor of applied anatomy, surgeon to Guadalupe Hospital; Dr. Carlos Villarán, professor of clinical surgery, and surgeon to Military Hospital; Dr. Mariano Alcedan; Dr. Constantino T. Carvallo, professor of gynecology; Dr. Manuel J. Costaneda, surgeon to Italian Hospital; Dr. Enrique Febrea Odriozola, professor of obstetrics; Dr. Juan J. Mostajo, surgeon to Italian Hospital; Dr. Ricardo Palma, instructor of anatomy of the Faculty of Medicine; Dr. Ricardo Pazos Varela, professor of genito-urinary surgery, surgeon to Dos de Mayo Hospital; Dr. Luis de la Puente, surgeon to Maison de Santé, honorary member of the Faculty of Medicine; Dr. Belisario Sosa Artola, professor of syphilis and skin diseases, surgeon to Bellavista Hospital.

Santiago. We have already spoken of our reception at Valparaiso and of our entertainment by the surgeons of Santiago. We found a genuine desire on the part of our committee of surgeons here to co-operate and to become affiliated in the work of the American College of Surgeons. We could not have had a more influential chairman than Dr. Gregorio Amunategui, and in our formal meeting we had the services of a young medical man as interpreter, although nearly all of the Chileans understand some English. Besides the chairman, the following surgeons were discussed and recommended for our consideration: Dr. David Benavente, Dr. Marcos Donoso, Dr. Liva Eujenio Diaz, Dr. Carlos Charlin, Dr. Victor Koerner, Dr. Eduardo Moore, Dr. Olejandro Mujica, Dr. Francisco Navarro, Dr. Correa Canpolican Pardo, Dr. Emilio Petit, Dr. Alejandro del Rio, Dr. Lucas Sierra, Dr. Jerman Valenzuela, Dr. S. Luis Vargas, Dr. Wall Jerónimo Alvarado, Dr. Silvano Sepúlveda, Dr. Alberto Adriasola, Dr. Luis Obalos, and Dr. Guillermo Muenich.

Valparaiso. It was considered desirable to consult committees in the two large cities of Chile, and accordingly we also met in conference with a selected group of surgeons in Valparaiso. We had already spent a pleasant forenoon with the members of this distinguished committee and looked forward to our conference with a great deal of pleasure. Our meeting was held in a beautiful garden in one of the favorite summer resorts near Valparaiso. The occasion was quite formal and Dr. Alberto Adriasola, the chairman, read an address and modestly suggested a few

names of surgeons whom they recommended for Fellowship in the College. Among those suggested were many men whom we had already met. Including his own name, these consisted of Dr. Guillermo Muenich, who, with Dr. Adriasola, had been recommended by the Santiago committee, Dr. Silvano Sepúlveda, Dr. Frederico Engelbach, Dr. Roberto Montt, Dr. Rudecindo de la Fuente, Dr. Juan Thierry, Dr. Miguel Manriquez, Dr. Ernesto Iturrieta, and Dr. Gaston Lachaise.

There seems to be the most cordial co-operation between the surgeons of these two Chilean cities. The surgeons of this country, like the leading men everywhere in South America, are of the broadest type. Their European travel and their familiarity with several languages besides their own, gives them a breadth of vision that is frequently lacking in many of our surgeons who are provincial in spite of the very bigness of their country.

Buenos Aires. On Friday, February 6, we met the committee of surgeons of Argentine which was interested in our mission in behalf of the College of Surgeons. In the conference were Drs. Vegas, Cranwell, Chutro, and Palma. Buenos Aires has a strong body of surgeons and surgical specialists. A modern city of a million and a half inhabitants, of necessity, would possess such a group. There are also a number of strong provinces of Argentine with cities of considerable importance. These, too, have their surgeons of quality. Our interview and discussion revealed the fact that the surgeons of this Republic are desirous of affiliating in the most cordial manner with the surgeons of the North American continent.

They submitted a list that they felt they could unreservedly recommend to the College. They also suggested a committee that would from time to time make further recommendations and pass on applications which naturally would come independent of them. It was gratifying to note the seriousness with which this group of men accepted the responsibility. The tentative list recommended contained the names of many men whom we had met on our previous visit. It is not an exaggeration to say that it would be difficult to find a group of surgeons in any capital of Europe or America which would excel the following:

José Arce
Nicomedes Antelo
Pedro Benedit
Eduardo Belaustegui
Enrique Bazterrica
Pedro Ovidio Bolo
Adrián J. Bengolea
Guillermo Bosch Arana
Daniel J. Cranwell
Pedro Chutro
Antonio F. Celesia
Pedro Caride Massini
Máximo Castro
Bartolomé N. Calcagno
Alejandro Ceballos
Oscar Copello
Delfor del Valle (hijo)
Juan B. Emina
Enrique Finochietto
Ricardo Finochietto
Avelino Gutierrez
Angel G. Gallo
Marcelino Herrera Vegas
José M. Jorge (hijo)
Castelfort Lugones
Luis Lenzi
Carlos Lagos García
Adolfo M. Lopez
Adolfo F. Landivar
Jorge Leyro Diaz
Francisco Llobet
José F. Molinari
Armando Marotta
Bernardino Maraini
Arturo J. Medina
Salvador A. Marino
Angel F. Ortiz
Pascual Palma
David F. Prando
Julio S. Passeron
Aquiles Pirovano
Rodolfo E. Pasman
Carlos Robertson Lavalle
Manuel Ruiz Moreno
Rodolfo A. Rivarola
Alberto Rodriguez Egaña
Ricardo Rodriguez Villegas
Miguel Sussini
Roberto M. Sole
Ricardo Sarmiento Laspiur
Luis A. Tamini
Herman Taubenschlag
Nicolás Tagliavache
Marcelo T. Viñas
Leandro Valle
Arturo Zabala
José A. Viale
Ricardo Spurr
Pedro Del Pino
Pedro Belou
Benjamín Abalos
Roberto Halahan
Eliseo V. Segura

Montevideo. We have dwelt upon the hospitality displayed by the profession of this important and interesting city. Our official greeting here was of the most cordial nature. The committee called a meeting in the amphitheater of the new hospital and we had the pleasure of meeting several members of the Faculty of Medicine who were not surgeons. The object of our visit was reviewed by Dr. Martin and interpreted by Dr. Lagos, and then amplified by Dr. Mayo. The list of surgeons who were finally recommended is only tentative and is to be supplemented by a few other names later on. This list is as follows:

Gerardo Arrizabaloga
Enrique Pouey
Horacio García Lagos
Lorenzo Merola
Manuel Quintela
Juan Pou Orfila
Augusto Turenne
Alberico Ysola
Alfonso Lamas
Alfredo Navarro
Carlos A. Belliure
Julio Nin y Silva

We have met in the surgeons of South America men of outstanding influence. There is something about their appreciation of worth that makes the man of education, culture, and professional ability the natural leader. Is it because of their world vision, brought about by their knowledge of foreign languages, their supplementary education in other lands, their love of general literature and the classics, and their dread of narrow provincialism?

GIFT OF $75,000 FROM CARNEGIE CORPORATION. MUNICIPAL HOSPITALS OF NEW YORK CITY APPROVE STANDARDIZATION

TWO events of interest in the progress of hospital standardization during the past month are, first, a gift of $75,000 from the Carnegie Corporation to the College to be used for hospital standardization; second, the hospitals of New York City, under the direction of the Department of Public Charities, officially adopted the standardization plan of the College.

The present gift from the Carnegie Corporation is the second which the Corporation has made to the College. In 1916 the Corporation gave $30,000, making a total now of $105,000 for hospital standardization. This amount is supplemented by funds of the College.

"By these gifts," said Mr. John G. Bowman, "the Carnegie Corporation has done more than to give financial aid to hospital standardization. It has given encouraging approval and world-wide recognition to the work. The trustees of the Corporation voted unanimously in favor of the appropriation, the subject being presented to the board by Dr. Henry S. Pritchett, President of the Carnegie Foundation for the advancement of Teaching, and by Mr. Elihu Root.

As the outcome of a meeting of the staffs of the hospitals under the direction of the Department of Public Charities in New York, held at the Academy of Medicine on the evening of January 23, plans were adopted for a review each month of the clinical records of these hospitals by their respective staffs. The medical profession in New York has long been aware that these hospitals maintain adequate case record systems for all patients; also that the laboratories of these hospitals are well equipped, well managed, and dependable. The one thing that remained to do was to institute staff meetings at these hospitals at which clear, concise reviews of what each staff had accomplished for the right care of its patients each month should be fearlessly considered. These staffs agreed unanimously that the time had come for such meetings and they therefore carried the plan through.

The data to be reviewed at the staff meetings each month are as follows, minor adjustments being made naturally as the needs of the hospital and the judgment of the respective staffs may indicate:

ANALYSIS OF HOSPITAL SERVICE

for month ending.....

DISCHARGED

Cured	
Improved	
Relieved	
Unimproved	
To return for secondary operation	
Admitted for diagnosis only	
Deaths within 48 hours	
Deaths institutional	
Released	
Labor	
Newborn	
Total Discharged	

DIAGNOSES

Provisional and final agree	
Provisional and final disagree	
Discharged with additional diagnosis	
Discharged with no diagnosis made	
Labor	
Newborn	
Total Diagnosed	

INFECTIONS

Institutional		On Admission	
Medical		Medical	
Surgical		Surgical	
Obstetrical		Obstetrical	
Total Infections			

DEATHS		AUTOPSIES	
Medical		Medical	
Surgical		Surgical	
Obstetrical		Obstetrical	
Newborn		Newborn	
Stillborn		Stillborn	
Total deaths		Total Autopsies	

CONSULTATIONS

Asked and obtained	
Asked, not obtained	
Indicated, not asked	

In addition to the foregoing data, analyses are also called for, first as to causes of death and, second, as to records of patients discharged as unimproved.

CHRONOLOGICAL STATEMENT OF HOSPITAL STANDARDIZATION

May 5, 1913 — American College of Surgeons organized in Washington, D. C. Betterment of service in hospitals among objects of College.

June 22, 1914 — Plan to raise permanent endowment fund for the College approved by the Fellows, the income from this fund to be used in carrying out purposes of the College.

December 1, 1915 — Endowment fund of $526,000 subscribed by Fellows of the College.

January 27, 1916 — Gift of $30,000 from the Carnegie Corporation, New York, to be used for hospital standardization.

September 27, 1916 — American Hospital Association in session at Philadelphia invited to co-operate with College in hospital standardization. Association appointed a committee to co-operate with the College as invited.

October 27, 1916 — Plan to organize State and Provincial Committees on Standards to guide and aid in the program of hospital standardization voted by Fellows.

November 30, 1916 — Members of State and Provincial Committees on Standards elected by ballot.

January 11, 1917 — Plan of hospital standardization, in relation to Catholic hospitals, approved by His Eminence James Cardinal Gibbons at Baltimore.

October 19-20, 1917 — Meeting of the State Committees on Standards in Chicago. Throughout two days the following subjects were considered:

1. The number, distribution, valuation, and general classification of hospitals; and the relation of hospitals to the general public.
2. What the profession of medicine wants in hospitals.
3. How to bring about desired conditions in hospitals.

About three hundred members of State Committees on Standards and sixty leading hospital superintendents present at Conference. The papers presented, together with summary of discussion, published as Bulletin, Vol. III, No. 1.

October 25, 1917 — General Hospital Committee of twenty-one appointed by Regents to outline questionnaire and consider the minimum standard as advised by Conference, October 20.

December 8-9, 1917 — General Hospital Committee met in Washington with Regents of College. An initial questionnaire formulated. Details of minimum standard considered with reference to the following: a system of financial accounting and of making annual reports; uniform nomenclature; the training of superintendents; the training of internes; the training of nurses; hospital organization; staff rules and regulations; the function of staff meetings; case records and follow-up of records; postmortem examinations; clinical laboratories; the out-patient department; the economic relation of the hospital to its community; ethics of medical practice in the hospital; education of patients and of the community in matters of health, hygiene, and sanitation; the responsibility of the hospital to the patient; encouragement of medical research and of medical education; the hospital library; continuity of service to patients by doctors; dietetics; the testing of materials and supplies before purchase; the receiving and checking-out of materials and supplies through the hospital storeroom; model plans for new buildings and additions; and means of increasing the financial support of the hospital.

December 10, 1917 — Meeting of Governors of College in Washington. Program of hospital standardization approved. Consensus of opinion that the work should be carried out through personal inspections by staff members of the College.

February 15, 1918 — General hospitals of 25 or more beds invited to co-operate with College in hospital program. Invitation and questionnaire sent to 2,711 hospitals. Copy of invitation and of questionnaire sent also to Fellows for their information.

March 1, 1918 — Minimum standard and plan of hospital standardization sent to hospitals and to Fellows. Bulletin, Vol. III, No. 3.

April 1, 1918 — Work of personal investigation of hospitals begun. Investigations limited to general hospitals of 100 or more beds. Visitors or inspectors employed to explain to hospital trustees, superintendents, and staffs the hospital program of College and to make specific reports of hospital conditions as indicated by minimum standard. Report forms designed for this purpose. Co-operation of Fellows with visitors. An illustration of a visitor's report follows:

HOSPITAL STANDARDIZATION REPORT

Name of Hospital: Blodgett Memorial Hospital, Grand Rapids, Michigan.
Date of Visit: March 15, 1919. *Visitor:* Anna C. Phillips.
Type: General. *No. of beds:* 125.
No. of Internes: None; usually 3. *No. in nurses' training school:* 71.
Staff Organization: Open hospital without definitely organized staff; no review or analysis of professional work; division of fees not permitted.
Case Records: Current records consisted only of nurses' notes, anæsthetic record in surgical cases, and final diagnoses. Occasional physical examinations and laboratory reports were found among the filed records. Records filed on shelves in general office by clerk.
Clinical Laboratories: Pathological: accessible, light, well equipped; no pathologist, no technician; facilities used occasionally by attending doctors. X-ray: accessible, well planned, completely equipped; no technician; facilities used only occasionally by attending doctors.
Notes: Conditions as to staff organization, case records, and laboratories discussed with executive committee of board and with superintendent; work of College explained. Effort being made to secure laboratory technician. Board responsive and much interested. Glad to co-operate. Ideals of all connected with hospital excellent.

SUMMARY OF FINAL ACTION REPORTED AUGUST 12, 1919

Staff Organization: Staff reorganized, meets bi-weekly to consider the character of the clinical service and other matters relative to the care of patients, such as laboratory service, etc. In the reorganization there are two groups:

1. Executive Group: Experts in special fields of work.
2. Associate Group: General practitioners.

In accepting appointment to staff, physicians and surgeons are required to agree to the following:

> "To abide by the rules and regulations of the Hospital, and to adhere at all times to the well recognized, lofty principles governing the reputable practice of medicine and surgery.
>
> "That as a principle I shall not engage in the division of fees under any guise whatever, nor knowingly permit any agent or associate of mine so to do.
>
> "To exercise to the best of my ability a constructive interest in the Hospital, and to co-operate in making it as potent a factor as possible in the preservation of public health in this community."

Case Records: A complete new record system instituted July 1, 1919. Complete case records including personal history, physical examination, working diagnosis, laboratory findings, treatment or operation, progress notes, and final diagnosis are kept for all classes of patients treated, free and pay.
Clinical Laboratories: The X-ray department is in charge of a full time roentgenologist; the pathological laboratory is in charge of a full time technician; serological and histological work sent to outside laboratory.

June 20, 1918

Meeting in Chicago of Catholic Hospital Association. The following resolutions were passed:

Be it resolved, That we, the Catholic Hospital Association of the United States and Canada, now assembled at Chicago in our third annual convention, approve of the work being done by the American College of Surgeons for the standardization of hospitals, and assure the College of our fullest co-operation in its endeavor for the betterment of hospitals and the resultant increased welfare of mankind.

Be it resolved, That we, the members of the Catholic Hospital Association, pledge ourselves to organize controlled staffs in our hospitals; to establish or continue an adequate system of case records, with a Sister in charge having full authority to demand the careful co-operation of doctors, internes, and nurses; to secure from our superiors, staffs, or friends, funds properly to equip all necessary laboratories and to bring about as soon as possible the scientific training of our Sisters and technicians of all kinds, anæsthetists, dieticians, record-keepers, and social service experts.

We further pledge ourselves to urge all surgeons who are privileged to practice in the hospitals of the Association, and who are not at this time Fellows in the American College of Surgeons, to qualify as soon as they are able for Fellowship in the College.

We further wish to express our desire that all doctors who practice in our hospitals be or become, as soon as practicable, members in good standing of their respective county medical societies and contribute their share to the active medical life of said societies.

We further wish to express our conviction that the secret division of fees, as condemned by the American College of Surgeons, is an unethical and nefarious practice which we pledge ourselves to keep out or root out of our hospitals.

June 21, 1918

Meeting in Chicago of Bishops and Archbishops(or their representatives) of the Catholic Church in the United States and Canada to consider the program of the College in relation to Catholic hospitals. Program of the College approved.

September, 1918

Meeting in Hamilton, Ontario, of the combined Surgical Section of the Ontario Medical Association and the Canadian Medical Association. The following resolution was passed:

Be it resolved, That we, the Surgical Section of the combined meeting of the Ontario Medical Association and the Canadian Medical Association, desire to go on record as approving the efforts being made by the American College of Surgeons to improve the status of surgical practice in our hospitals . . . that the right to attempt major surgery should be restricted to those who are recognized as having scientific training, experience, sound judgment, and honesty of purpose . . . that examinations for diagnosis and for treatment should be made more closely associated with clinical laboratories than they are at present. . . .

October 23, 1918

Hospital conference arranged to be held in New York in connection with the Clinical Congress of the College. Fellows of the College and hospital superintendents of the United States and Canada invited. Meeting cancelled because of influenza.

January 15, 1919

Bulletin, Vol. IV, No. 1, published. Detailed explanation of the minimum standard with special reference to the meaning and use of case records; 27,000 copies distributed.

January 15, 1919

Bulletin, Vol. IV, No. 2, published. Forms suggested for the keeping of case records in a simple, convenient, and adequate manner; 27,000 copies distributed.

February 1, 1919, to May 15, 1919

Hospital conferences, many of them including one or more states or provinces, arranged throughout western half of United States and Canada. Hospital standardization presented to hospital trustees, superintendents, medical profession, nurses, and to general public. These conferences usually included special meetings with county medical societies, chambers of commerce, business men's associations, and Canadian clubs. The conferences were designed to supplement the work of the hospital visitors on the staff of the College. Meetings were held at St. Louis, Memphis, New Orleans, Fort Worth, Denver, Ogden, Salt Lake, San Diego, Los Angeles, San Francisco, Portland, Tacoma, Seattle, Victoria, Vancouver, Calgary, Edmonton, Regina, Winnipeg, Minneapolis.

The following program is typical of these occasions:

HOSPITAL STANDARDIZATION CONFERENCE

PORTLAND AND VICINITY

April 11, 1919

LUNCHEON, CHAMBER OF COMMERCE, 12:15 P.M.

A. L. MILLS, Presiding

The Hospital and its Community . . . . . JOHN G. BOWMAN
Director of College, Chicago
and CHARLES B. MOULINIER, S. J.
President Catholic Hospital Association, Milwaukee

AFTERNOON SESSION, 2:00 P.M., LINCOLN HIGH SCHOOL

The Occasion for the Conference . . . . . DR. KENNETH A. J. MACKENZIE
Chairman State Committee on Standards

What is Hospital Standardization? . . . . . JOHN G. BOWMAN
(Clinical Laboratories, Case Records, Staff Organization)

Discussion:

(a) Clinical Laboratories . . . . . DR. A. E. MACKAY
MAJOR R. L. BENSON

(b) Case Records . . . . . MAJOR RALPH C. MATSON
MAJOR WM. S. KNOX

(c) Staff Organization . . . . . DR. S. E. JOSEPHI
DR. E. F. TUCKER

Summary . . . . . CHARLES B. MOULINIER, S. J.

EVENING SESSION, 8:00 P.M., LINCOLN HIGH SCHOOL

Hospital Progress; The Citizen's Part . . . . . A. L. MILLS
What the Medical Profession Wants in Hospitals . . . . . JOHN G. BOWMAN
Team-Work for Success . . . . . CHARLES B. MOULINIER, S. J.
Summary of Conference . . . . . DR. KENNETH A. J. MACKENZIE

September 11, 1919

American Conference on Hospital Service organized at Cincinnati. Chairmanship of committee in charge of standardization of hospital service voted to American College of Surgeons.

October 24, 1919

Report to Fellows of the College in connection with the ninth meeting of Clinical Congress of the College, New York, concerning hospital standardization as applied to general hospitals of 100 or more beds. The practical administration of the minimum standard presented.